

# **REMEDIAL ACTION PLAN AND SYSTEM DESIGN**

**FOR THE  
WIGGINS PROPERTY  
3454 Santa Rosa Avenue  
Santa Rosa, California**

**NCRWQCB FILE #1TSR007  
SCDHS-EHD Site #00001849  
Project No. 04-259801-007**

March 2005

Prepared for:

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Prepared by:



**WINZLER & KELLY**  
CONSULTING ENGINEERS

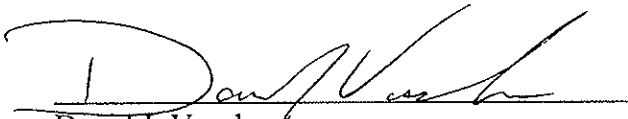
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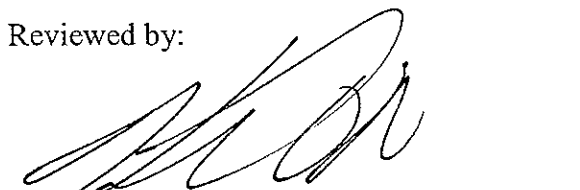
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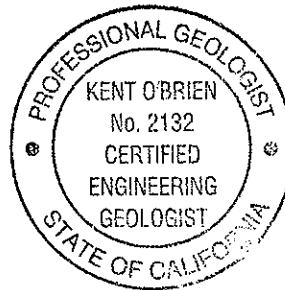
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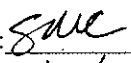
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## **1.0 INTRODUCTION**

### **1.1 Summary**

The Wiggins property is located at 3454 Santa Rosa Avenue, in Santa Rosa, California. The Location Map and Site Map are presented as Figures 1 and 2, respectively. The site has been the subject of ongoing soil and groundwater investigations and monitoring activities since the removal of four steel underground storage tanks (UST) in 1986 that contained regular and unleaded gasoline and diesel. Interim corrective actions consisting of soil excavation was performed and a reported total of 4,200 tons of contaminated soil was removed. A November 23, 2004 *Corrective Action Plan* (CAP) was submitted to the Sonoma County Department of Health Services, Environmental Health Division (SCDHS-EHD) and approved in their January 19, 2005 letter (see Appendix A).

This Remedial Action Plan (RAP) summarizes the extent of soil and groundwater contamination at the site. It also presents design details for the proposed ozone sparge system and provisional High-Vacuum Dual-Phase Extraction (HVDPE) system.

The Ozone System is proposed to address the extent of the dissolved-phase and minimal free-phase hydrocarbon impacts. If the extent of free-phase hydrocarbons is larger than expected and encountered during the ozone sparge point installation, Winzler & Kelly proposes to address these areas of free-phase hydrocarbon impacts and supplementing the ozone sparge system with the periodic operation of HVDPE. The purpose of the HVDPE system will be to more rapidly remove free-phase hydrocarbons, thus reducing the time required for site cleanup.

If needed, the proposed HVDPE system will be operated on a periodic basis in conjunction with the ozone sparge system for the first year. The HVDPE system will be discontinued once groundwater monitoring results indicate the absence of free product in the groundwater wells. From that point forward, the ozone sparge system would be expected to remediate dissolved-phase petroleum hydrocarbons at the site.

This RAP includes detailed design for installation of the system, as required by the State Water Resources Control Board, UST Cleanup Fund (State Fund) and details both the primary remedial option, ozone sparging, and the provisional periodic use of a HVDPE system if needed to mitigate free product.

Refer to the Winzler & Kelly's November 2004 CAP for a comprehensive discussion of the soil and groundwater conditions at the site.

### **1.2 Site Description**

The site is currently a vacant lot and is located on Santa Rosa Avenue, south of East Robles Avenue, in southeastern Santa Rosa, California (Figure 1). This site is in the central portion of the Santa Rosa Plain Sub Basin, which extends from Windsor south to Penngrove. The approximate elevation at the site is 105 feet above mean sea level. Currently, there are three on-site monitoring wells (MW-6 through MW-8) and five off-site monitoring wells (MW-5, and MW-9 through MW-12) associated with the site cleanup and groundwater monitoring process.

The topography of the area surrounding the site is generally flat, with a slight slope to the west-southwest.

### **1.3 Site Hydrogeology**

Santa Rosa is located within the Coastal Range province, which extends 400 miles along the western half of California. The geologic structure of the area is comprised of northwest trending ridges and intervening valleys that were formed by faulting. The surrounding area's geology is shown on maps in Geology for Planning in Sonoma County, Special Report 120 (California Division of Mines and Geology, 1980), as Quaternary age (2 million years or younger) alluvial fan deposits bordering uplands with the heads of the alluvial fans incised by channels partially filled by terraced deposits of younger alluvium.

Boring logs from on- and off-site borings indicate that the lithology at the site generally consists of brown lean clay with varying amounts of silt and sand to depths of approximately 13 to 19 feet below ground surface (bgs) for most of the site. Gradational changes from lean clays to silt and silty sand to gravels are encountered in the area of the former UST excavation. The gravels are first encountered from 13 to 17 feet bgs and extend to a range of 20 to 24 feet bgs and are saturated. This gradational change and gravel unit suggests a channel deposit of a former streambed.

Periodic groundwater monitoring and sampling has occurred at the site since November 1986. Groundwater at the site is typically measured at depths ranging from 3 to 15 feet bgs in the monitoring wells. Groundwater historically flows to the southwest at an average gradient of 0.01 ft/ft.

### **1.4 Surface Water in Proximity to Site**

The closest natural surface water is an unnamed seasonal creek approximately 600 to 800 feet east (upgradient) of the site flowing south into Todd Channel, which flows into Laguna de Santa Rosa in the Russian River watershed.

### **1.5 Contaminant Characteristics**

#### **1.5.1 Contaminants Present**

Contaminants present at this site originated primarily from a leaking gasoline UST and the associated piping. Specific compounds associated with the gasoline release include benzene, toluene, ethyl benzene, and xylenes (BTEX). No other sources of potential groundwater impacts have been reported at the site. These include the former diesel USTs. Historical investigations have determined that there is no presence of oxygenated compounds such as methyl tert-butyl ether (MTBE) in the groundwater at the site. Although MTBE was commercially produced as early as 1979, the removal of the on-site gasoline UST (1986) predates the widespread use of MTBE. The fact that MTBE is not found in any of the monitoring wells, or where residual soil contamination from the on-site release(s) would be expected to occur, indicates that the MTBE and other oxygenated compounds are not contaminants of concern.

### **1.5.2 Soil Contamination**

In late October and early November 2000, approximately 4,200 tons of contaminated soil was excavated from the site, transported, and disposed to Forward Landfill in Manteca, California. Soil contamination was removed by the excavation activities to the arbitrary target cut-off concentration of 800 mg/kg of TPH approved by the State Fund, according to EnviroNet's July 22, 2002 Report. A review of the available project files has not produced any document recommending or directing EnviroNet on this arbitrary target cut-off concentration.

Based on all of the soil data collected to date at the site, it appears the previous soil excavation to remove the USTs and subsequent over-excavation activities was successful in removing a majority of the soil contamination down to groundwater depth. However, because the excavation was restricted due to site limitations (i.e., sidewalk, property boundary limits and the arbitrary target goal of 800 mg/kg) the excavation was terminated before the removal of all contaminated soil was completed. As a result, residual source material remains in soils in three areas: 1) along the northeastern portion of the 2000 excavation; 2) in a limited area along the southern extent of the 1986 excavation; and 3) under the sidewalk and street to the west of the site. Low levels of contamination related to groundwater may have re-contaminated the backfill within the former excavation.

### **1.5.3 Groundwater Contamination**

Destroyed monitoring wells MW-1, MW-2, and MW-4 have been reported to have contained free-phase hydrocarbons; however, they were abandoned in 1998 in preparation of the extensive soil excavation activities. The remaining on-site wells (MW-6 through MW-8) which are upgradient of the former USTs and soil excavation areas have essentially been non-detect since they were installed in 2000. Petroleum hydrocarbon have been detected in off-site monitoring wells MW-5 (1994) and MW-10 (2002) since they were installed, with free-phase hydrocarbons observed in MW-10 (0.15 feet, July 2004). On November 3, 2003, a PetroTrap<sup>TM</sup> skimmer was installed by EnviroNet in monitoring well MW-10 and later removed by Winzler & Kelly in April 2004 due to the very low recovery of free-phase product. Off-site monitoring wells MW-9, MW-11, and MW-12 have been reported as non-detect since their installation and define the lateral and downgradient extent of the groundwater impact at the site.

Groundwater sample results indicate the highest concentrations of petroleum hydrocarbons are present in off-site monitoring wells MW-5 and MW-10, where free-phase hydrocarbons are present. The highest concentrations of TPH-G found in monitoring well MW-5 were detected on January 15, 2002, at 7,800 µg/L and have steadily declined to a historic low during the most recent July 2004 sampling event of 870 µg/L.

For the January 2004 sampling event, toluene, ethyl benzene, total xylenes, and MTBE compounds were all below the action levels in MW-5. Fuel oxygenates and lead scavengers have historically been detected in MW-5, but have also declined to non-detect except for the lead scavenger EDC at 1.7 µg/L. For the January 2004 event, only TPH-G exceeded the action level (50 µg/L) in MW-5 at 870 µg/L.

Based on the current monitoring well network, only monitoring well MW-5 has detectable concentrations of petroleum hydrocarbons, except for the free-phase hydrocarbons contained in

monitoring well MW-10. The extent of the dissolved hydrocarbons is defined downgradient by monitoring wells MW-11 and MW-12, upgradient by MW-6 and MW-7, and laterally to the south by MW-8 and MW-9. Current groundwater conditions in the area of destroyed monitoring wells MW-1, MW-2, and MW-4, where they historically had documented free-phase hydrocarbons, as well as the dissolved hydrocarbons in destroyed monitoring well MW-3, is unknown.

#### 1.5.4 Trends in Contaminant Concentration

The dissolved impact is located along the western property in the area of the former USTs and extends into Santa Rosa Avenue. TPH-G and BTEX constituents identified are primarily limited to off-site monitoring wells in MW-5 and MW-10 located directly downgradient of the former USTs. Historically, monitoring wells MW-1 and MW-4 contained free-phase hydrocarbons until they were destroyed in 2000 prior to the over-excavation of impacted soils. The sampling and monitoring results indicate that the most significant petroleum-related hydrocarbon contamination present is in the area of monitoring well MW-10, which contains free-phase hydrocarbons. The dissolved plume is expected in the vicinity of the former UST excavation and extending into Santa Rosa Avenue.

The presence of free-phase hydrocarbons and its associated dissolved components exceed the respective Water Quality Objectives. The overall concentrations, based on the current monitoring well network, indicate a declining dissolved concentration trend. The presence of petroleum hydrocarbons detected in off-site monitoring wells MW-5 and MW-10 indicates contaminant migration in the direction of groundwater flow, which has consistently been calculated toward the southwest. Downgradient wells MW-11 and MW-12 have delineated the plume and are still reported as non-detect for all analytes tested.

## 2.0 PROPOSED CLEANUP LEVELS

The Drinking Water Standard is the most stringent potential beneficial use for groundwater at the site, and will be initially applied to each constituent as the proposed cleanup standard. The established cleanup goals for the concentrations of constituents of concern at the Wiggins Property are presented below:

Constituent	Proposed Cleanup Level	Reference for Criteria
TPH-G	<50 µg/L	USEPA Taste and Odor Threshold is 5 µg/L, but detection limit is 50 µg/L and is controlling.
Benzene	<1 µg/L	Primary MCLs from Title 22, Section 64444 Organic Chemicals. Water Quality Objective.
Toluene	<42 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water Quality Objective. There is a less stringent CA DHS Action Level of 100 µg/L applied to the Toxicity Water Quality Objective.
Ethyl benzene	<29 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water

Constituent	Proposed Cleanup Level	Reference for Criteria
		Quality Objective; there is a less stringent CA MCL of 580 µg/L.
Xylenes	<17 µg/L	USEPA Taste and Odor Threshold, Federal Register 54(97): 22064-22138; applied Taste and Odor Water Quality Objective; there is a less stringent CA MCL of 1,750 µg/L.
MTBE	<5 µg/L	35µg/L is USEPA health advisory for non-carcinogenic chronic exposure; applied Toxicity Water Quality Objective. 13µg/L is the primary MCL, 5µg/L is the secondary MCL.
1,2-dichloroethane	<0.5 µg/L	Primary MCLs from Title 22, Section 64444 Organic Chemicals. Water Quality Objective.

### 3.0 SYSTEMS INSTALLATION AND OPERATION

As described in the CAP, an ozone injection system is an *in situ* groundwater remediation technology that involves the injection of ozone under low pressure into wells installed into the saturated zone (below the water table). This results in rapid destruction of hydrocarbons that come in contact with the ozone and with oxygen as the degradation product, promotes biodegradation by increasing the dissolved oxygen (DO) concentrations in the subsurface, stimulating the aerobic biodegradation in the saturated and unsaturated zones.

The proposed ozone injection system will consist of 12, 1-inch sparge points installed at approximate 20-foot centers along a transect adjacent to the sidewalk and Santa Rosa Avenue and a second transect in the source area of the former UST excavation (Figure 3). Ozone will be generated and pumped into the ozone points, followed by air from a compressor. The proposed system would be located near the southern portion of the site (Figure 4). The pressure and flow to each of the points will be regulated from a control panel and will allow for optimization of the amount of ozone and airflow rates to each of the points. New and existing wells will be monitored to observe the change in contaminant concentrations and biodegradation activity.

The proposed provisional HVDPE system uses a high-vacuum pump to simultaneously remove both liquid and vapor from low-permeability formations. The system removes contaminants from above and below the water table by lowering the water table around the well and also preventing water mounding during the application of high vacuum.

The HVDPE system proposed for this site will specifically target the free-phase hydrocarbons and consist of a mobile unit utilized periodically when needed. This remedial method, in combination with the ozone injection system, will address both the free-phase and dissolved-phase components in the area of highest contamination and the residual contamination beneath Santa Rosa Avenue. The placement of the extraction wells from which the HVDPE will be



conducted takes into account the current and historical presence of free-phase hydrocarbons identified at the site. They are placed so as to allow for the most effective removal of free-phase contaminants from the portion of the site. In addition, existing wells may also be used to perform HVDPE (MW-10). If necessary, the initial HVDPE effort will be scheduled for 15-days, after which the site monitoring wells will be monitored for the presence of free-phase hydrocarbons. Subsequent HVDPE events would be dependent of the absence or presence of free-phase hydrocarbons.

In addition to the proposed 12 ozone sparge points, up to five new HVDPE extraction wells (if necessary) are proposed for the remedial and monitoring efforts at the site. The locations of these wells have not yet been determined, but would be in the area of encountered free-phase product. These additional wells may be required to provide extraction points to remove free-phase hydrocarbons at the site. Tentative locations for possible extraction wells would be: two located in Santa Rosa Avenue, two extraction wells in the area of the former UST excavation and one extraction/monitoring well located near destroyed well MW-2 (east and adjacent to the former UST excavation).

The tasks required to complete this RAP are described below:

### **3.1 Drilling Preparation Activities**

Prior to the initiation of any drilling activities, each boring location will be marked with white paint and Underground Services Alert (USA) will be notified at least 48 hours before the field event to check the site for underground utilities. Access arrangements, encroachment permits and scheduling will be made with the current owner of the site and specific responsible agencies. All necessary drilling permits will be obtained from the SCDHS-EHD. The SCDHS-EHD and the North Coast Regional Water Quality Control Board (NCRWQCB) will be notified of the proposed field activities at least five days in advance. Street encroachment permit will be obtained from the City of Santa Rosa if the proposed provisional extraction wells are needed.

### **3.2 Well Installation Activities**

This task includes the installation of the 12 ozone sparge points on site, and potentially up to five HVDPE extraction wells, three on-site and two off-site, if necessary. Because the site has been thoroughly investigated, no soils samples will be submitted for analysis; however, the borings drilled for the ozone sparge points will be monitored for free-phase product by collecting grab groundwater samples from each boring and analyzed for TPH-G to determine if additional extraction wells are necessary.

#### **3.2.1 Ozone Sparge Point Installation**

The ozone sparge points will consist of 1-inch diameter wells and installed at 20 feet on center as shown on Figure 3. The ozone sparge points will provide ozone to the areas where dissolved hydrocarbon concentrations have been identified.

The ozone sparge points will be installed using a hollow-stem auger (HSA) drill rig with a minimum 6-3/4-inch diameter auger flights. The borings will be extended to the bottom of the shallow water-bearing zone and the underlying clay unit. The underlying clay unit has been

documented to range from 20.5 to 25 feet bgs in the area of proposed treatment. The actual depth of the proposed ozone sparge points will be dependent on field conditions encountered of the site. Care will be taken to ensure that each ozone sparge point is located in the permeable zone of the aquifer and not in the clay zones.

The 1-inch diameter ozone sparge point will consist of a short 18-inch long, 0.020 continuous wrapped stainless steel well screen, fitted to ½-inch stainless steel drop pipe extending from the well screen to the surface. A filter pack consisting of #2/12-Monterey silica sand will be placed adjacent to the entire screened interval and extend approximately 1-foot above. A two-foot hydrated bentonite seal will be placed above the sand and finished with a neat cement grout to the surface. The surface completion will consist of a traffic rated vault set in concrete. Provisions for the connecting the sparge points to the ozone injection system control panel will be made. A typical ozone sparge point construction detail is shown on Figure 5. Site-specific field procedures for installing the ozone sparge points are provided in Appendix B.

### **3.2.2 High-Vacuum Dual-Phase Extraction Well Installation**

HVDPE wells would be installed after the proposed ozone wells have been completed. If necessary, and dependent upon the extent of free-phase product, up to five proposed extraction wells will be installed using a HSA drill rig utilizing a minimum 10-inch diameter auger flights. The extraction wells will be constructed using a 4-inch schedule 40 PVC well casing, 0.010 continuous wrapped screen, and a filter pack consisting of #2/12 Monterey silica sand. The filter pack will be placed from the total depth of 20 to 25 feet bgs to approximately 1 foot above the screened interval at 9 feet bgs, followed by 2 feet of hydrated bentonite. Above the hydrated bentonite, a neat cement seal will be installed and finished with a traffic-rated vault set in concrete. Each well will the screened interval set at the interface of the shallow aquifer and the underlying clay unit as described in the section above (3.2.1 Ozone Sparge Point Installation) and extending to 10 feet bgs. The remainder of the well will consist of blank casing to the surface. The most effective operation of the system will be during the summer and fall when the water levels are at there lowest. It is likely that high water levels during the winter will make the operation impractical. A typical extraction well construction detail is shown on Figure 6. Details regarding construction are provided in the Site-Specific Procedures for Monitoring Well Installation provided in Appendix B.

One of the five tentative extraction wells is proposed to replace destroyed well MW-2 and would allow for monitoring and possibly for extraction via the HVDPE (Figure 4). This well will be installed similar to the extraction wells with the exception of the length of the screened interval. This proposed well will be completed within the shallow water-bearing zone with approximately 15 feet of screen, so that the potentiometric surface can be monitored for free-phase hydrocarbons. If free-phase hydrocarbons are observed, the well will be connected to the HVDPE system to remove the free-phase hydrocarbons. Details regarding monitoring well installation are provided in Appendix B.

### **3.3 Ozone Sparge System Installation**

The aboveground portion of the ozone sparge system will consist of an ozone cabinet, an oil-free air compressor, and controls contained in an enclosure and anchored to a concrete pad in the

southern portion of the site. Ozone distribution lines from the ozone generator cabinet to the individual sparge points will be of Teflon FEP material and contained within conveyance piping. Temporary electrical service will also need to be brought in to provide power to the ozone sparge system. The proposed locations of the 12 ozone sparge points are shown on Figure 3. Project Specifications for the ozone sparge system installation is presented in Appendix C.

### **3.4 High-Vacuum Dual-Phase Extraction System**

If warranted, Winzler & Kelly will use a HVDPE system consisting of a mobile truck-mounted vacuum pump assembly to mitigate free-phase hydrocarbons at the site in addition to the ozone sparge operations. Vacuums up to 29 inches-Hg will be applied to each selected well. Extracted water will be treated to appropriate cleanup levels and discharged to the sanitary sewer under permit from the City of Santa Rosa. Extracted vapor will be treated and discharged under a permit issued by the Bay Area Air Quality Management District.

The process will be applied to the new (if needed) HVDPE wells and to existing well MW-10. To maximize system recovery efficiency, as many as five HVDPE wells may be installed and used simultaneously on free-phase hydrocarbons in groundwater. The initial phase of the program would most likely include a 15-day event, followed by an additional 15-day event if warranted. During the HVDPE events, system parameters will be recorded such as vacuum, temperature, vapor flow rate, and the amount of groundwater extracted from the site. During the scheduled rest period, the extraction wells will be monitored for the presence of free-phase hydrocarbons. Additional HVDPE events may be required to complete the removal of the free-phase hydrocarbons at the site and may be revised depending on initial results. The rate of extraction of air/water cannot be determined; however, the effectiveness of this process is well documented and will be evaluated after the first HVDPE event. A detailed description of the HVDPE system process is provided in Appendix D.

### **3.5 Remedial System Operations**

Operation of the ozone sparge system will continue year round for a minimum of one year and most likely will run for approximately two years. Operation of the ozone sparge system will be in accordance to the manufactures recommendations and guidelines outlined in their Operation and Maintenance Manual.

The operation of a HVDPE system would be provide by a specialty service vendor and is currently not scheduled. The HVDPE effort, if necessary, would operate independent of the ozone sparge system. The HVDPE system is a self-contained operation, where no site construction, other than possibly the installation of specially designed extraction wells. If necessary, the proposed initial scheduled event will comprise of one 15-day event.

## **4.0 PROPOSED MONITORING AND REPORTING**

The site is currently monitored on a quarterly basis. The groundwater samples, water levels, and presence/absence of free-phase hydrocarbon will be performed according to the schedule presented in Table 1.

The DO levels will be measured using an electronic DO meter. In addition to DO, ORP will be analyzed to assist in the overall effectiveness evaluation. Any down-hole probe will be decontaminated between wells. Groundwater samples collected during the routine quarterly monitoring events will also be used to evaluate the remedial process. Time vs. concentration plots for selected wells will be prepared and presented.

The pressure to each sparge point will be recorded at the time of each operation and monitoring (O&M) event and prior to shutting off for the routine monitoring and sampling events. The system shutdown is necessary to ensure that the groundwater level data is not influenced by the operation of the ozone sparge system. The well caps will then be removed and the wells allowed to equilibrate for a minimum of 30 minutes prior to measuring water levels.

The DO levels and ORP results in the groundwater from the monitoring well samples will be collected, recorded and used to determine if the cycle time in the sparge points needs to be adjusted to allow for greater oxygen transfer. Any such action will be reported in the quarterly monitoring reports and the system evaluation will be documented and submitted on a semi-annual basis.

## **5.0 TIME TO ATTAIN PROPOSED CLEANUP LEVELS**

The proposed ozone sparge system will address the dissolved- and current free-phase contaminate plume. It is estimated that the ozone sparge system will operate for a minimum of one year, but will more likely operate for two years. It is recommended that the system operation and cleanup levels obtained be reviewed at the 6-month operation mark and reported on a semi-annual basis. A plot of the TPH-G and BTEX levels versus time will be prepared, and an estimate of time to obtain cleanup levels presented. If necessary, the HVDPE process will be initially proposed for a total of 15-days and would be specifically for the removal of the free-phase hydrocarbons documented at the site. The intent of the HVDPE would be to directly mitigate the free-phase hydrocarbons and reduce the duration of remedial effort at the site.

## **6.0 PROPOSED IMPLEMENTATION SCHEDULE**

Upon receipt of approval by the SCDHS-EHD and subsequent cost pre-approval from the UST Fund, Winzler & Kelly will install the ozone sparge points. The HVDPE extraction wells will be installed as necessary based on the site data and field observations during the remedial efforts.

Upon receipt of approval of the system design by the SCDHS-EHD, on behalf of Mr. Floyd Wiggins, Winzler & Kelly will obtain three bids for the installation of the ozone sparge system including the equipment, installation, trenching, and piping. Winzler & Kelly will then obtain cost pre-approval for the UST Fund of the expected costs to implement this RAP and operate the system. Once cost pre-approval has been obtained, the permitting process with the City of Santa Rosa, SCDHS-EHD, and PG&E will be initiated. It is estimated that these tasks will take approximately three months.

Once the cost is pre-approved and the contract awarded, time will be required for the contractor to mobilize, order, and assemble all of the system components. The new sparge points will also need to be installed by a drilling contractor (under Winzler & Kelly's oversight), and temporary

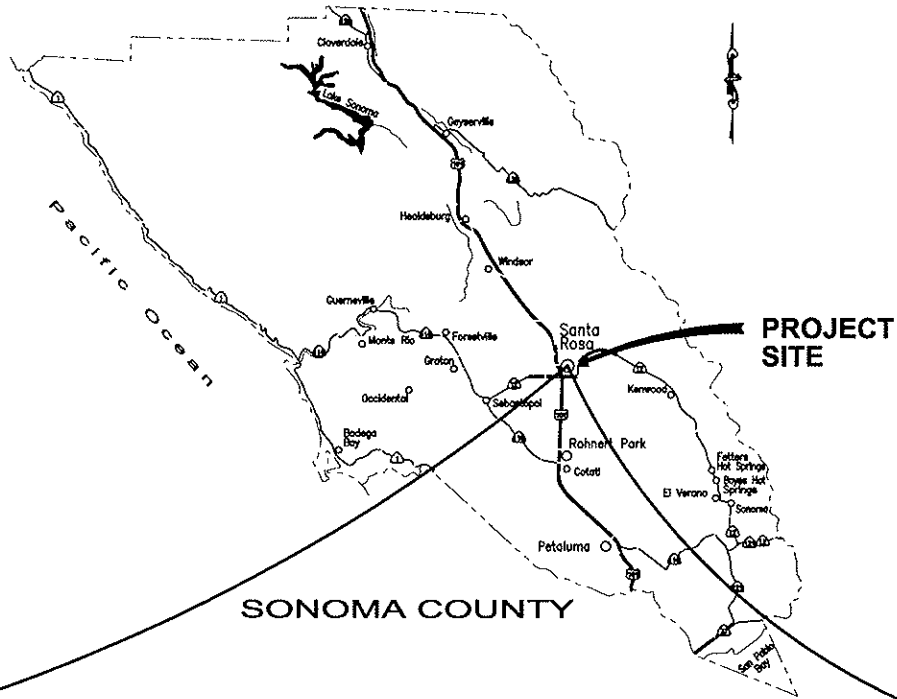
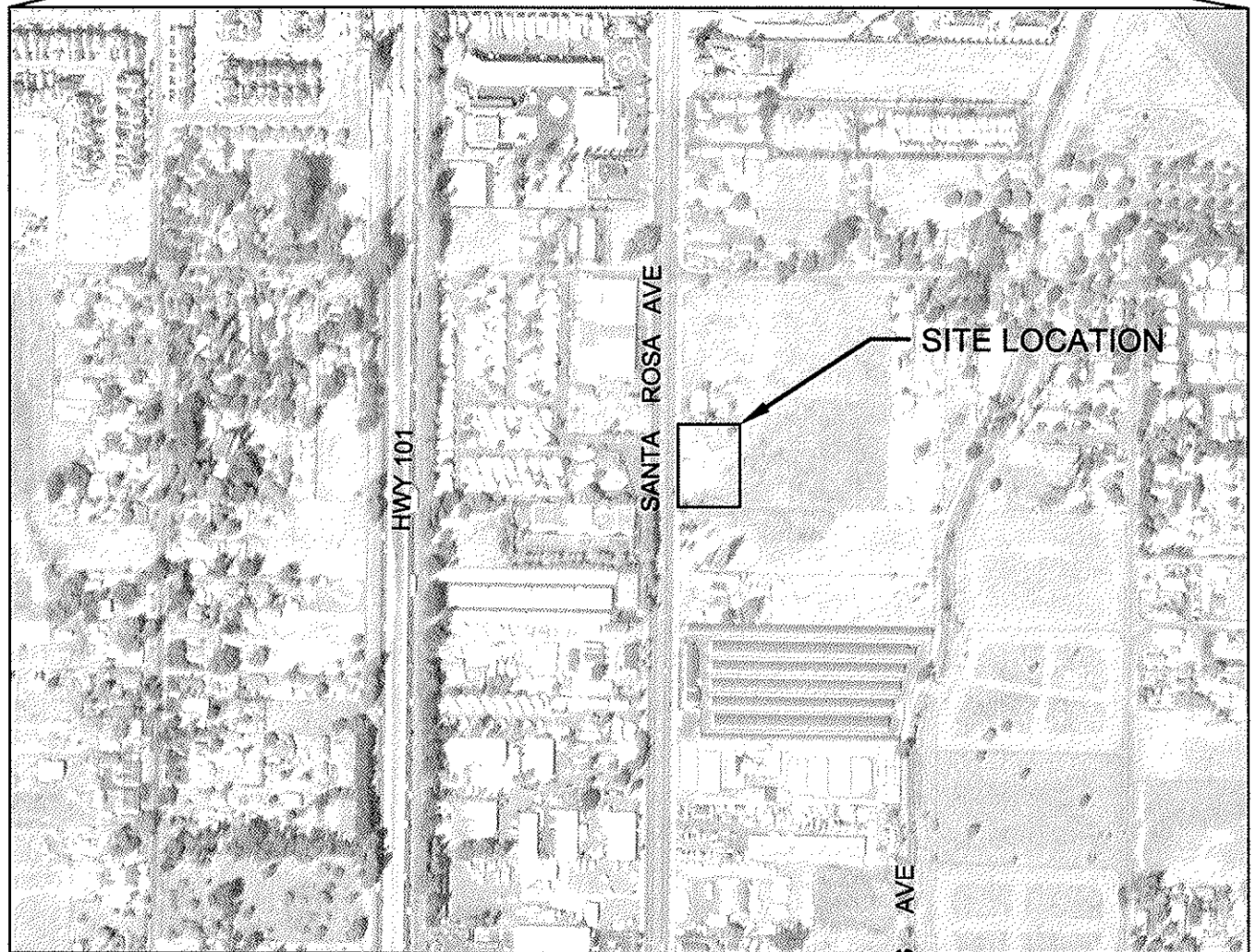
electrical service brought to the control panel at the site. It is estimated that it will take approximately 90 days from the time the contract is awarded, to system operation.

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

It is recommended that the ozone sparge system be operated for a minimum of one year and will most likely be operated for up to two years. The TPH-G and BTEX levels from the quarterly sampling events will then be plotted versus time for each well and presented in each Semi-Annual Operation and Maintenance Report.

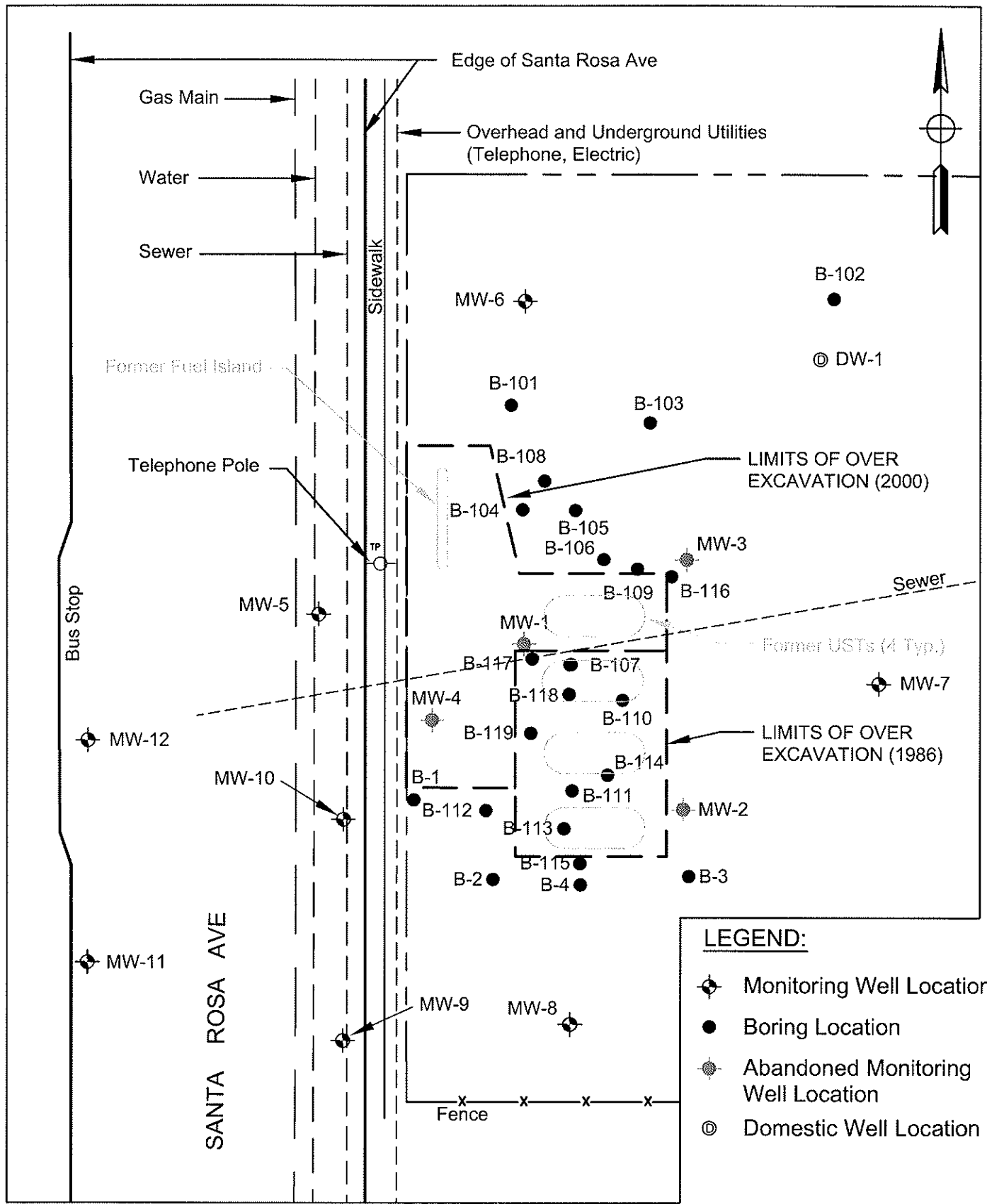
If the site data and field observation indicates the extent of free-phase product is more than anticipated, Winzler & Kelly recommend that a mobile HVDPE system be used to reduce and mitigate the presence of the free-phase product in order to expedite the site remedial effort. This would require the possibility of installing special extraction wells, applying for waste discharge permit, an air discharge permit, and contracting a mobile HVDPE contractor to perform the work. The mobile HVDPE system would operate on a 15-day duration and would be dependent on the actual site conditions. If this additional remedial effort is necessary, Winzler & Kelly will notify the SCDHS-EHD on the planned activities and obtain all required permits.





WIGGINS PROPERTY  
3454 Santa Rosa Ave  
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LOCATION MAP  
FIGURE 1



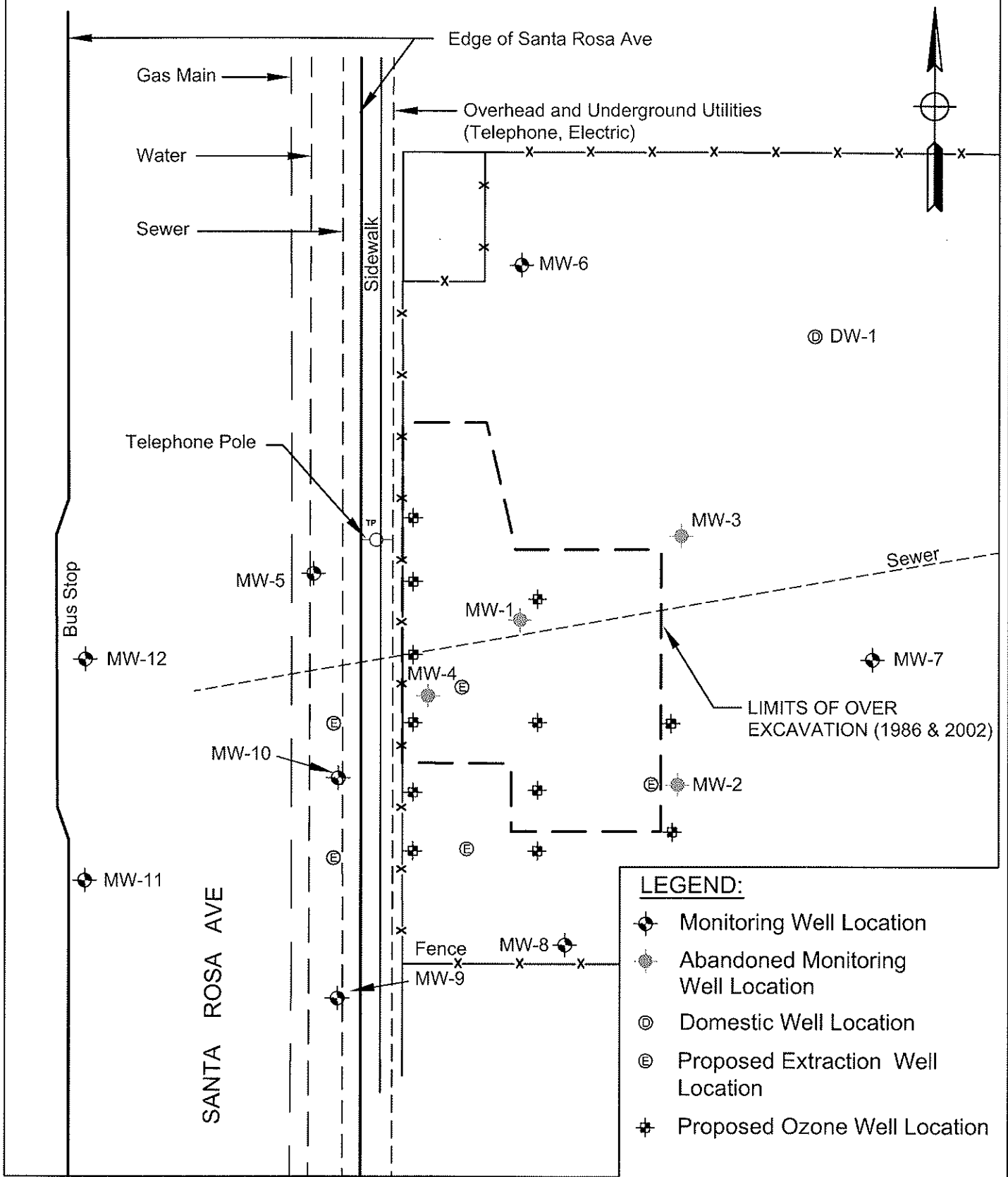
# **LEGEND:**

- Monitoring Well Location
- Boring Location
- Abandoned Monitoring Well Location
- Domestic Well Location

WIGGINS PROPERTY  
3454 Santa Rosa Ave  
Santa Rosa, California

**SITE MAP  
FIGURE 2**





Scale: 1"=40'

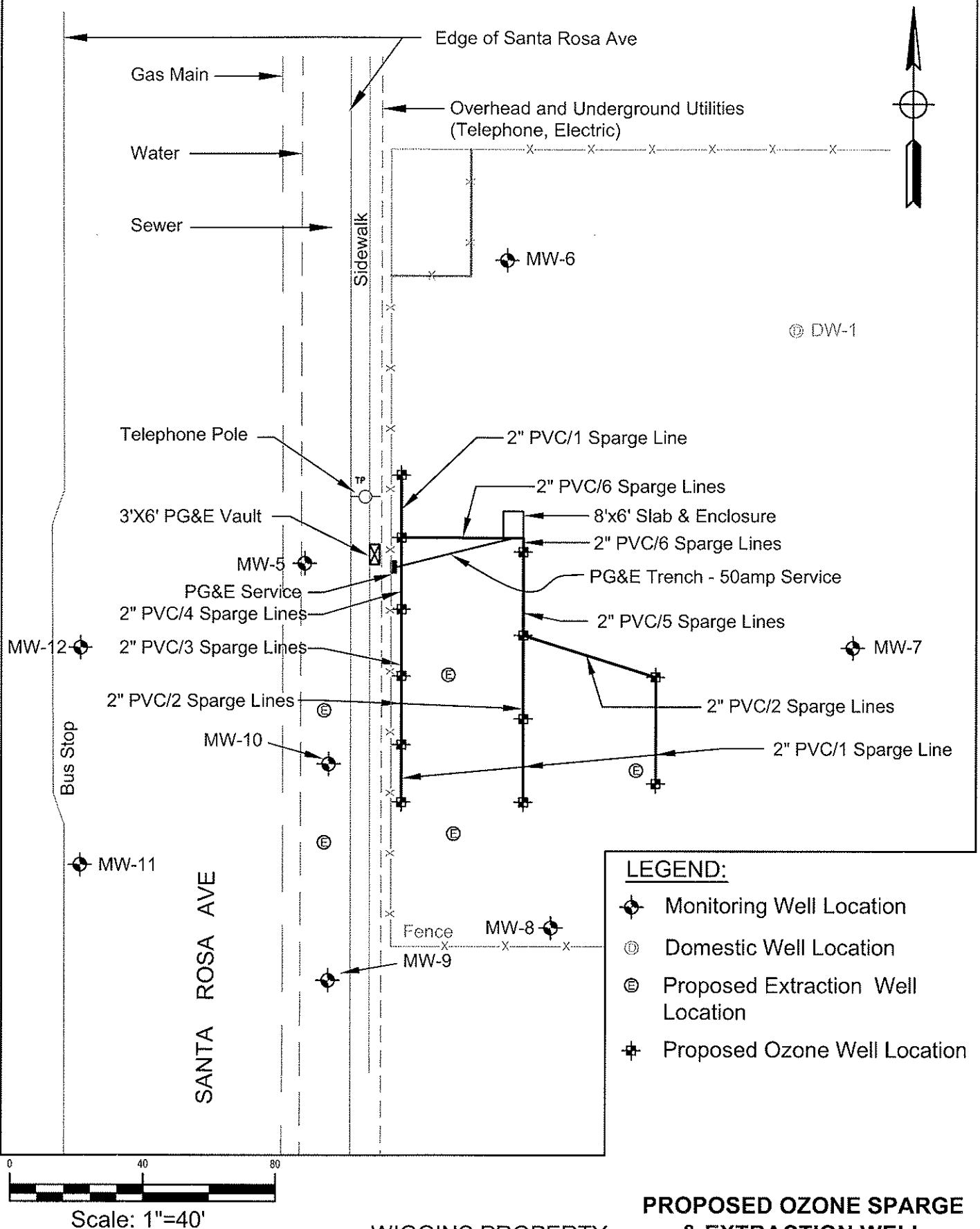
WIGGINS PROPERTY  
3454 Santa Rosa Ave  
Santa Rosa, California

**PROPOSED OZONE SPARGE  
& EXTRACTION WELL  
LOCATION MAP**

**FIGURE 3**

**WINZLER & KELLY**  
CONSULTING ENGINEERS

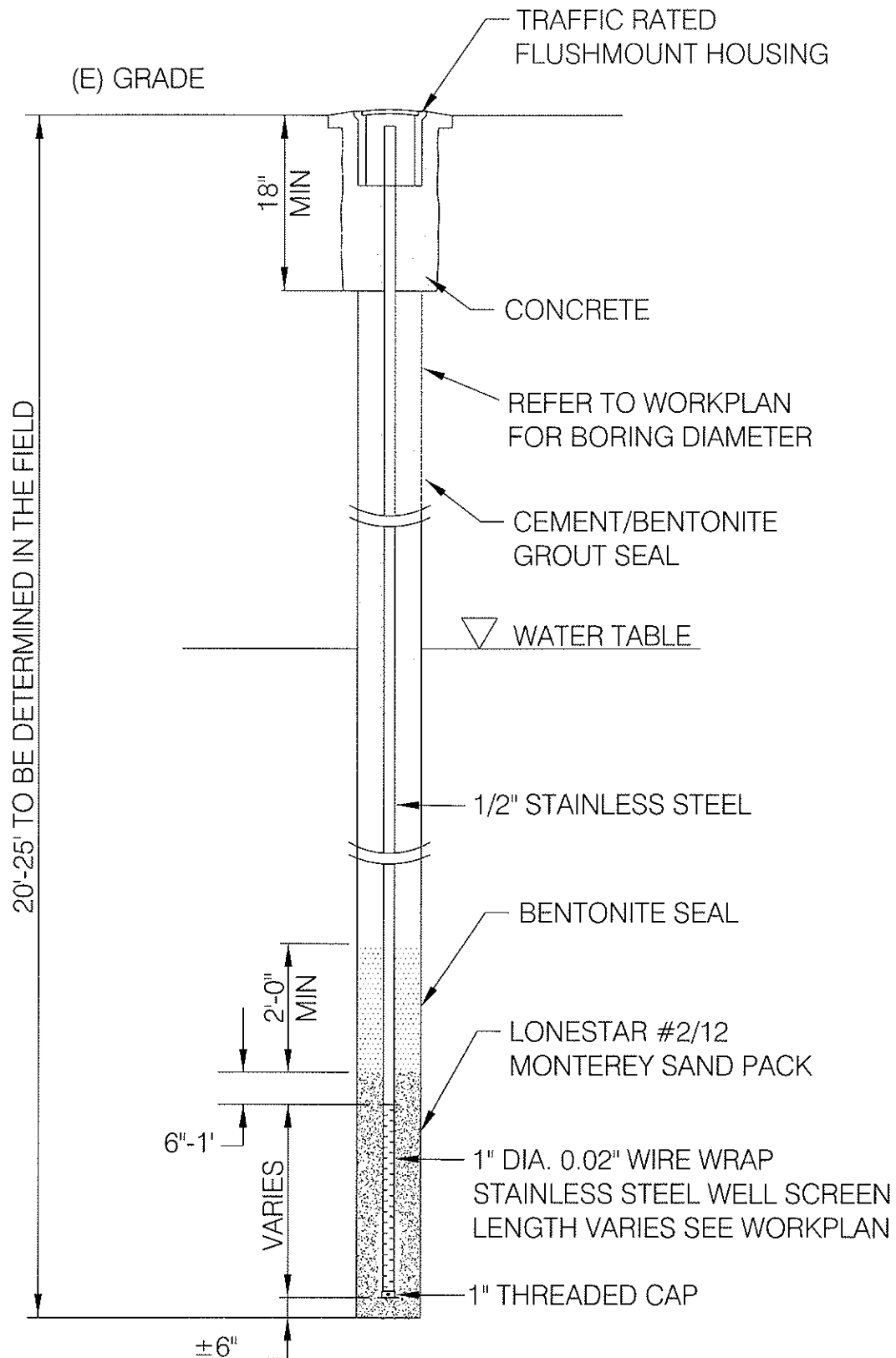
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WIGGINS PROPERTY  
3454 Santa Rosa Ave  
Santa Rosa, California

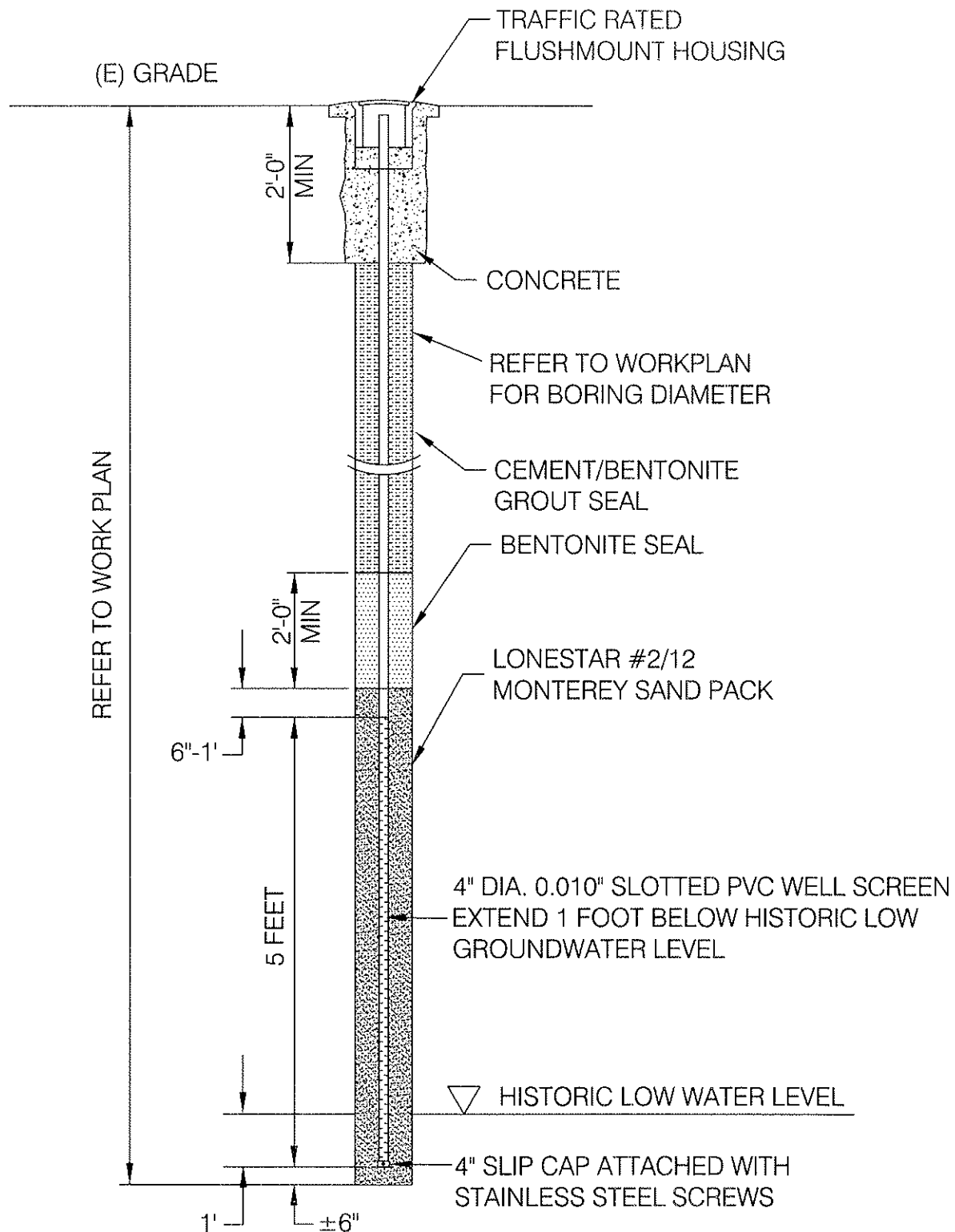
**PROPOSED OZONE SPARGE  
& EXTRACTION WELL  
PIPING PLAN  
FIGURE 4**

**WINZLER & KELLY**  
CONSULTING ENGINEERS



**TYPICAL OZONE SPARGE POINT  
CONSTRUCTION DETAIL  
WIGGINS PROPERTY  
3454 SANTA ROSA AVE  
SANTA ROSA, CA  
FIGURE 5**

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**TYPICAL HIGH-VACUUM WELL  
CONSTRUCTION DETAIL  
WIGGINS PROPERTY  
3454 SANTA ROSA AVE  
SANTA ROSA, CA  
FIGURE 6**



**Table 1. Proposed Groundwater Monitoring and Sampling Schedule**

Wiggins Property  
3454 Santa Rosa Avenue, Santa Rosa, California

Monitoring Well ID	Current Sampling Frequency	Recommended Sampling Frequency	Recommended Analysis	Basis for Monitoring
MW-5	Quarterly	Quarterly	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Monitors impacted area. Additional sampling as follows: Baseline and Annually (4th Quarter); bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-6	Semi-Annually	Quarterly	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Will serve as an early warning detection well for DW-3450
MW-7	Semi-Annually	Semi-Annually	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Upgradient, historically non-detect
MW-8	Semi-Annually	Quarterly	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Will serve as an early warning detection well for DW-3496
MW-9	Quarterly	Semi-Annually	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Historically non-detect and close to MW-8 and MW-11, which will be sampled quarterly
MW-10	Quarterly	Quarterly	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Monitors impacted area. Additional sampling as follows: Baseline and Annually (4th Quarter); bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-11	Quarterly	Quarterly	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Downgradient and off site, and will serve as an early warning detection well for DW-3415 and DW-3455. Additional sampling as follows: Baseline and Annually (4th Quarter); bromide, bromate, dissolved - hexavalent chrome, -vanadium, -selenium and -molybdenum.
MW-12	Quarterly	Semi-annually	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Historically non-detect and close to MW-11

**Table 1. Proposed Groundwater Monitoring and Sampling Schedule**

Wiggins Property  
3454 Santa Rosa Avenue, Santa Rosa, California

Monitoring Well ID	Current Sampling Frequency	Recommended Sampling Frequency	Recommended Analysis	Basis for Monitoring
DW-3415	Quarterly	As needed basis	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Petroleum related constituents not detected on April 29, 2004. The well is located downgradient of monitoring wells MW-11 and MW-12. Samples will be collected from DW-3415 only if detections are present in either of the samples collected from MW-11 or MW-12.
DW-3450	Quarterly	As needed basis	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Petroleum related constituents not detected on May 6, 2004. The well is located upgradient of the contaminated area. Samples will be collected from DW-3450 only if detections are present in the samples collected from MW-6.
DW-3455	Quarterly	As needed basis	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Petroleum related constituents not detected on April 29, 2004. The well is located downgradient of monitoring wells MW-11 and MW-12. Samples will be collected from DW-3415 only if detections are present in either of the samples collected from MW-11 or MW-12.
DW-3473	Quarterly	Discontinue Sampling		DW-3473 is inoperable and cannot be sampled.
DW-3496	Quarterly	As needed basis	TPH-G 8015M BTEX, Oxys 8260B DO, ORP, pH	Winzler & Kelly will seek permission to sample the well during the next quarterly sampling event. If petroleum related constituents are not identified in the groundwater sample, then future samples will be sampled only if there is a detection in monitoring well MW-8.
DW-3521	Quarterly	Discontinue sampling		This well is located over 2000 feet crossgradient of 3454 Santa Rosa Avenue.

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## **Appendix A**

### **Agency Correspondence**





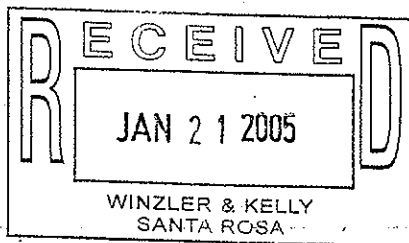
COUNTY of SONOMA  
DEPARTMENT OF HEALTH SERVICES

Mark A. Kostielney - Director

*Environmental Health Division*

Jonathan J. Krug - Director

January 19, 2005



COPY

Floyd Wiggins  
Wiggins Enterprises  
1370 Airport Blvd.  
Santa Rosa, CA 95403-1009

Re: 3454 Santa Rosa Avenue, Santa Rosa, CA — Leaking Underground Storage Tank Site  
SCDHS-EHD Site # 00001849, NCRWQCB Site # 1TSR007, SWRCB Cleanup Fund #1146  
Review of *Corrective Action Plan* (Winzler & Kelly, November 2004)

Dear Mr. Wiggins:

This Department received the referenced Corrective Action Plan (CAP) on November 29, 2004. The submittal has been reviewed by staff and has been found generally acceptable. Please note, however, the specific comments as follows:

1. Water Quality Objectives must include objectives for 1, 2 dichloroethane at 0.5 ppb (MCL) and for MTBE at 5 ppb (secondary MCL).
2. A Remedial Action Plan detailing the remediation system installation and operation is now required.

March 19, 2005 is established as the due date for submittal of the Remedial Action Plan. The State Cleanup Fund has discontinued its preapproval process because of a staffing shortage; however, reasonable and necessary costs should be eligible for reimbursement. The site must be in compliance with this Department's directives to be eligible for funding.

This Department appreciates your continued effort to remediate this site. Please write or telephone (707) 565-6574 if you have any questions.

Sincerely,

Cliff Ives  
Senior Environmental Health Specialist  
Leaking Underground Storage Tank Local Oversight Program

CI

- c: Mr. Luis Rivera, North Coast Regional Water Quality Control Board  
Mr. David Charter, SWRCB Cleanup Fund  
Mr. Kent O'Brien, Winzler & Kelly, 495 Tesconi Circle, Santa Rosa, CA 95401

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## **Appendix B**

### **Site-Specific Field Procedures**

# WINZLER & KELLY CONSULTING ENGINEERS

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## Site-Specific Ozone Sparge Point Installation Procedures Wiggins Property 3454 Santa Rosa Avenue, Santa Rosa, California

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### 1. Objective

Install ozone sparge points.

### 2. Background

Ozone sparge points will be installed in accordance with the procedures described herein.

### 3. Personnel Required and Responsibilities

Staff Geologist: An experienced staff geologist (SG) will ensure that the ozone sparge points will be properly installed and oversee the logging of the borings. The SG will be responsible for complying with the procedures regarding installation of the ozone sparge points, collection of samples, containerization of samples, and documentation.

Drilling Technicians: Drilling technicians from a drilling company holding a C-57 license will perform the biosparge point installation.

### 4. Equipment Required

- Rotary auger drilling rig
- Level C and D safety equipment
- Boring Log Form / Munsell Soil Color Charts
- Laboratory provided sample containers
- En Core<sup>®</sup> Sampler Set
- Sample labels / Indelible marker
- Disposal gloves
- Ice chest with ice
- ASTM Classification Guide
- Wash equipment
- Organic Vapor meter (OVM)

### 5. Procedure
















- Winzler & Kelly will obtain all required permits prior to installing the ozone sparge points. A Site-Specific Safety Plan detailing site hazards, site safety, and control will be prepared prior to any field work. Underground Services Alert (USA) will be notified of the planned work at least 48 hours prior to drilling.

- An OVM will be used during the drilling and sampling activities to screen for the presence of Volatile Organic Compounds (VOCs).
- A HSA drilling rig equipped with 8-inch diameter augers will be used to install the ozone sparge points. After the desired depth has been reached the ozone sparge point is constructed by lowering a 1/2-inch diameter stainless steel riser pipe with 1 to 3 feet of 1-inch 0.020 slotted stainless steel well screen threaded at the bottom through the HSAs. After 6 inches of sand, the attached sparge assembly is lowered through the HSA annulus to the bottom of the boring. A sand filter pack is installed from the total depth to approximately 0.5 to 1 foot above the screened interval. A two-foot thick bentonite seal is then installed above the sand filter pack that prevents the grout from entering the screens. With the bentonite barrier in place, neat cement and bentonite slurry is then installed in the annulus to form a well seal.
- The ozone sparge point borings will be installed to the depth described in the project RAP. Soil samples if will be collected for lithologic descriptions only by driving an 18-inch long, split-spoon sampler at specified intervals. One 6 inch sample will be retained for field description of the lithology.
- Soil types will be classified and logged using the ASTM Visual Manual Procedure (D 2488-93) and Munsell Soil Color Charts. Using a PID Meter, the soil headspace will be field screened within a sealed sample bag.
- The lithology, moisture, density, color, sample identification, OVM measurements, and well construction details will be recorded on the boring logs as appropriate.
- Groundwater grab samples will be collected from each borehole using new disposable plastic bailers. Groundwater samples will be retrieved from the borehole and decanted from the bailer to laboratory prepared 40-mil VOAs. The samples will be labeled and stored on ice at 4-degrees Centigrade until delivery to a California Licensed environmental analytical laboratory under a fully executed chain-of-custody. Groundwater samples will be analyzed for total petroleum hydrocarbons by EPA Method 8015M.
- All ozone sparge points will be constructed using 1/2-inch diameter stainless steel tubing and 1 to 3 feet of 1-inch diameter 0.020-slotted stainless steel well screen. The screened interval will be placed as described in the RAP. A threaded cap will be attached to the bottom of the casing. Ozone sparge point construction details will be documented on the boring log.
- A sand pack of #2/12 washed sand will extend from 6 inches below the bottom of the stainless steel casing to 6 inches above the slotted well screen. The sand will be poured through the HSAs as the augers are removed from the boring.
- A seal of bentonite clay will extend a minimum of 2 feet above the sand pack. A cement/bentonite slurry, not exceeding 5 percent bentonite, will be placed by tremie

pipe to 2 feet below the ground surface. The top of the stainless steel casing will be approximately 2 inches below grade. A threaded cap will be placed over the top of the casing during well completion to prevent debris from entering the well.

- The wells will be protected by 18-inch flush-mounted traffic boxes set in concrete. The tops of the traffic boxes will be set above grade with a gently sloping concrete rim. The ozone sparge point identification number will be stamped in the traffic box lid.
- Upon completion of the ozone sparge point installations, each point will be secured by bolting down the lid of the flush-mounted traffic box.

# Explanation for Winzler & Kelly Boring Logs

<b>Coarse Grained Soils</b> (more than half of soil > No. 200 sieve)	<b>Gravels</b> (More than half of coarse fraction > no. 4 sieve size)		<b>GW</b>	Well graded gravels or gravel-sand mixtures, little or no fines
			<b>GP</b>	Poorly graded gravels or gravel-sand mixtures, little or no fines
			<b>GM</b>	Sandy gravels, gravel-sand-silt mixtures
			<b>GC</b>	Clayey gravels, gravel-sand-silt mixtures
	<b>Sands</b> (More than half of coarse fraction < no. 4 sieve size)		<b>SW</b>	Well graded sands or gravelly sands, little or no fines
			<b>SP</b>	Poorly graded sands or gravelly sands, little or no fines
			<b>SM</b>	Silty sands, sand-silt mixtures
			<b>SC</b>	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
<b>Fine Grained Soils</b> (more than half of soil < No. 200 sieve)	<b>Silts and Clays</b> <b>LL = &lt; 50</b>		<b>ML</b>	Inorganic silts and very fine sands, rock flour, silty fine sands or clayey silts with slight plasticity
			<b>CL</b>	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			<b>OL</b>	Organic silts and organic silty clays of low plasticity
	<b>Silts and Clays</b> <b>LL = &gt; 50</b>		<b>MH</b>	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			<b>CH</b>	Inorganic silts of high plasticity, fat clays
			<b>OH</b>	Organic clays of high plasticity, organic silty clays, organic silts
<b>Highly Organic Soils</b>			<b>Pt</b>	Peat and other highly organic soils

**Grain Size Chart**

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size In Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 7.76
	3" to 3/4"	76.2 to 4.76
Sand	3/4" to No. 4	19.1 to 4.76
	No. 4 to No. 200	4.76 to 0.074
Silt and Clay	No. 4 to No. 10	4.76 to 2.00
	No. 10 to No. 40	2.00 to 0.420
	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

**Relative Density (SPT)**

SANDS AND GRAVELS	BLOWS/FOOT
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	32 – 50
VERY DENSE	OVER 50

**Consistency (SPT)**

SILTS AND CLAYS	BLOWS/FOOT
VERY SOFT	0 – 2
SOFT	2 – 4
MEDIUM STIFF	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 22
HARD	OVER 22

- ✕ Initial water level measured during drilling (date in *italics*)
- ▼ Static water level measured after well development (date in *italics*)
- ✕ Depths where soil samples were recovered

---

## **Appendix C**

### **Project Specifications**

**PROJECT SPECIFICATIONS  
FOR  
OZONE SPARGE SYSTEM INSTALLATION**

**FOR THE  
WIGGINS PROPERTY  
3454 SANTA ROSA AVENUE  
Santa Rosa, California**

**NCRWQCB FILE #1TSR007  
SCDHS-EHD SITE #00001849  
PROJECT NO. 04-259801-007  
AP #010-760-001**

March 2005

 **WINZLER & KELLY**  
CONSULTING ENGINEERS  
495 Tesconi Circle  
Santa Rosa, CA 95401-4696  
(707) 523-1010



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### Figures

- Figure C-1 – Location Map
- Figure C-2 – Proposed Ozone Sparge & Extraction Well Piping Plan
- Figure C-3 – Typical Ozone Sparge Point Construction Detail
- Figure C-4 – Ozone Process and Instrumentation Diagram

### Attachments:

- Attachment A – Specified Part Details
- Attachment B – System Design Layout Cut Sheets

## **1.0 INTRODUCTION**

For the purposes of this document the term ENGINEER will apply to Winzler & Kelly Consulting Engineers the environmental consultant. The term OWNER will apply to the property owner and responsible party for the site. The term CONTRACTOR will apply to the contracting firm preparing the costs associated with the bid and the contractor/contracting firm selected through the procurement process to perform the detailed work scope.

## **2.0 SITE DESCRIPTION**

The site is currently a vacant lot and is located on Santa Rosa Avenue, south of East Robles Avenue, in southeastern Santa Rosa, California (Figure C-1). This site is in the central portion of the Santa Rosa Plain Sub Basin, which extends from Windsor south to Penngrove. The approximate elevation at the site is 105 feet above mean sea level. Currently, there are three on-site monitoring wells (MW-6 through MW-8) and five off-site monitoring wells (MW-5, and MW-9 through MW-12) associated with the site cleanup and groundwater monitoring process. The topography of the area surrounding the site is generally flat, with a slight slope to the west-southwest.

## **3.0 OZONE SPARGE POINT INSTALLATION (BY OTHERS)**

Prior to the ozone sparging system installation, the ENGINEER will oversee a C-57 licensed drilling contractor install 12 ozone sparge points (SP-1 through SP-12). The ozone sparge points will be installed at approximately 20 feet on center, with 1-inch diameter 304L stainless steel sparge points and riser piping, as shown on Figures C-3 and C-4. Installation of the ozone sparge points is not part of this contract and will be completed by others. The specified well vault boxes, Pomeco, part #6110-18WT will be provided and set in either pea gravel or sand by the drillers upon completion of the sparge point installation. The CONTRACTOR will use these well box vaults for the installation.

## **3.0 OZONE SPARGE SYSTEM**

Applied Process Technology, Inc. (APT) will contract with the OWNER to furnish the ozone sparge unit and will coordinate directly with the CONTRACTOR for installation and final system hook-up. The ozone system is a compact unit, which consists of a NEMA 3R cabinet with UL-rated parts and an enclosed ozone generator. The ozone system is enclosed in a 2.5x2.5x4.5 foot weather resistant cabinet and is air cooled by installed fans. The total ozone system dry weight is approximately 300 pounds and requires a 115 Volt, single-phase, 60 Hz (15 amp service) to operate. Along with the ozone unit, the remedial system includes an oil-less air compressor. A 115 Volt, single-phase, 60 Hz (20 amp circuit) is required for this portion of the system. Electrical requirements are the ozone system is shown on Figure C-4 and detailed in Section 5.1.

## **4.0 CONTRACTOR'S RESPONSIBILITY FOR SAFETY**

The CONTRACTOR shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the work. The requirements shall apply continuously and not be limited to normal working hours. Safety

provisions shall conform to U.S. Department of Labor, the California Occupational Safety and Health Act (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, and any regulations that may apply.

## **5.0 SITE WORK**

The CONTRACTOR is responsible for coordinating delivery of the ozone sparge unit constructed by APT and the installation of the ozone sparge unit in the enclosure. APT will provide ozone delivery tubing connections to the ozone unit. The CONTRACTOR will include bringing in electrical service, and providing and installing either a steel or plastic enclosure around the ozone sparge unit. The CONTRACTOR will trench and backfill from the unit enclosure to the individual sparge points (SP-1 through SP-12), completing all connections, and testing the unit for system leaks and startup with the ENGINEER to ensure the system is operating correctly. These are discussed in more detail below.

### **5.1 Underground Trenching**

- CONTRACTOR will provide all labor and equipment to complete the trenching as illustrated in Figure C-2. All trenching will be in native dirt and no concrete, asphalt, or other permanent surface material is expected.
- CONTRACTOR will excavate trenches from the system enclosure to the ozone sparge points and to the PG&E electrical source (Figure C-3). CONTRACTOR will mark the trench locations in white paint and notify Underground Service Alert (USA) at 1-800-227-2600, two working days before excavating. CONTRACTOR will saw cut asphalt prior to trenching. Excavated asphalt will be disposed of by recycling by the CONTRACTOR. Trenches will be excavated to allow the PVC conveyance piping to be buried a minimum of 12-inches below ground surface (bgs).
- CONTRACTOR will install an external electrical panel equipped with one 115 Volt, single-phase, 60 Hz (15 amp) circuit breaker for the ozone generator unit and one 115 Volt, 60 Hz (20 amp) circuit breaker for the oil-less air compressor. One additional 115 Volt, 60 Hz (20 amp) circuit breaker for the electrical exhaust fan and an outlet for general use. All breakers must be GCFI rated and an emergency shutoff switch mounted on the exterior of the enclosure. CONTRACTOR to coordinate all utility hook up with PG&E.

### **5.2 Piping and Valves (Ozone Delivery)**

- CONTRACTOR will install 2-inch (minimum) SCH 40 conveyance conduit or equivalent piping from the system compound to the ozone sparge points. Figure C-2 illustrates the system piping layout and laterals to each sparge point location. CONTRACTOR to provide and install  $\frac{3}{8}$ -inch O.D. Teflon FEP (0.03-inch wall thickness) distribution tubing (no substitutions) for ozone injection (Ryan Herco # 0319-091). Individual tubing to be installed within the conveyance conduits sized as noted on

Figure C-2. The ozone delivery tubing will be housed within the 2-inch (minimum) conveyance conduit (Figure C-4).

- CONTRACTOR will install 2-inch long radius sweeps at all changes in direction of conveyance conduit and to individual ozone sparge points shown on Figure C-3 and Figure 2 of Attachment A. At each sparge point, CONTRACTOR will provide and install a ½-inch compression to a ½-inch threaded female connector (Swagelok #SS-810-71-8) to the ½-inch stainless steel sparge point riser tubing. A ½-inch by 3-inch stainless steel nipple will be connected to the female connector and a threaded ½-inch stainless steel Tee (Swagelok #SS-8-T-10K). The Tee will be installed in the vertical orientation with a ½-inch stainless steel threaded plug (Swagelok #SS-8-P) installed at the top. A ½-inch threaded check valve made of Kynar material (Ryan Herco # 5162-005) will be connected to the Tee in the horizontal position with the flow direction towards the well. From the check valve, install a ½-inch FNPT by a 3/8-inch O.D. tubing connector made of Kynar material (Ryan Herco # 0607-056). CONTRACTOR will complete the well head connection of the ¾-inch O.D. Teflon FEP ozone delivery line to the 3/8-inch compression fitting provided by the CONTRACTOR. Figure 2 of Attachment A provides a detail of the specific pipe and delivery tubing connection for each sparge point. CONTRACTOR is responsible for the replacement of any and all o-rings in the specified plumbing fittings and connectors provided by the CONTRACTOR to those compatible with Ozone.
- Figure 2 of Attachment A (GES Drawing) provides a detail of the specific pipe and delivery tubing connection for each sparge point. This figure is a general well head design from the sparge and injection point manufacture.
- CONTRACTOR will provide permanent identification labels on each ozone supply line at the system panel location.
- The CONTRACTOR will backfill the trench with compacted native material to the specified depth shown on Figure C-3, and post a no drive barrier to prevent vehicles from driving across the trenched area. CONTRACTOR will blow and clear all tubing lines clean with air prior to the final connection to the ozone sparge delivery points to ensure that no debris remains in the distribution lines. CONTRACTOR will connect the designated tubing lines to the ozone sparge points. CONTRACTOR will install the ENGINEER provided weather-tight, traffic-rated 18-inch diameter steel cover from Pomeco (Part #6110-18WT) well boxes over each well point and complete the final installation of the well boxes with concrete as shown on Figure C-3. A Pomeco well box specification sheet is shown in Attachment A.
- With ENGINEER present, CONTRACTOR will pressure test the supply lines. Perform testing by plugging the end of the line prior to the connection with the ozone sparge point riser pipes and then pressurizing the lines to 30 psi of air for a minimum of 30 minutes. The delivery lines will pass if the pressure drop during the test is less than 2 psi.

### 5.3 Unit Pad and Equipment Enclosure

- CONTRACTOR will construct a 6x8 foot concrete pad in the location shown on Figure C-2. The concrete pad shall be constructed with a minimum thickness of 4-inches above the existing surface. The slab should include No. 4 rebar around the perimeter of the slab and wire tied at all splices and 6X6 inch wire mesh installed in the field of the slab. CONTRACTOR will furnish and install a plastic shed enclosure and mount/attach to the concrete slab. Enclosure dimension should be suitable for a 6x8 foot concrete pad. The enclosure should be a Duramax, Duramate 6X8 foot vinyl storage shed and is available locally. A product specification sheet is enclosed in Attachment A. CONTRACTOR will install an electric fan inside the system enclosure at the top of the gable end of the enclosure and a 24-inch by 24-inch air vent along the base of the enclosure for system airflow circulation. A product specification sheet is enclosed in Attachment A.
- CONTRACTOR will anchor the ozone system provided by the ENGINEER to the concrete pad. CONTRACTOR will permanently mount (bolt down) the ozone system equipment cabinet to concrete pad to prevent movement due to potential vibration. CONTRACTOR will permanently mount (bolt down) a 10-gallon electric powered oil-free air compressor furnished by the ENGINEER inside system enclosure using vibration isolation pads. The outlet of the air tank shall be fitted with a ½-inch ball valve, to allow for complete shutoff of air supply to the ozone unit. The outlet of the pipe will be ½-inch diameter and will be fitted with a 0.5-micron coalescing filter (Grainger #6B259) furnished by the CONTRACTOR. The filter will prevent debris from fouling of the ozone unit. The compressor to be fitted with an intake filter and silencer to ensure no fouling of the compressor and to reduce the operation noise. CONTRACTOR to provide and install all required compressor fittings, this includes but not limited to, pressure switch, filters, vent flow meter, pressure gauges (see Attachment B).
- CONTRACTOR will post the following signs: 1) No smoking, 2) Placard identification for oxidizer agent (ozone), and 3) Emergency contact info.

## 6.0 GENERAL REQUIREMENTS

### 6.1 Supplies and Equipment

CONTRACTOR will provide all conveyance pipe, fittings, Teflon FEP tubing (no substitutions), and materials to complete job. CONTRACTOR will wrap all stainless steel threaded piping connections with Teflon tape. No paste type joint compounds will be used for pipe and tubing connections (unless specified). CONTRACTOR will remove all construction debris, including excess soil and concrete upon completion of construction. The CONTRACTOR and APT will provide the ENGINEER with a binder containing all instruction and service manuals, cut sheets of the products, and components installed within 30 days of passing system pressure test. The CONTRACTOR will also provide the ENGINEER with an *AS BUILT Drawings* (Record Copy of Drawings) within 30 days on completion of the project.

## **6.2 System Start-Up**

Upon completion of system installation the CONTRACTOR and APT will be on-site jointly to perform a final system start-up and shutdown procedure. CONTRACTOR will assist APT in the initial system startup. The ENGINEER will be notified and will also attend the initial system startup.

March 18, 2005

Mr. Max Dunaway  
Dunaway Enterprises, Inc.  
2260 South Estrella  
Mesa, AZ 85202-6309

**Re: Bid Solicitation for Installation of an In-Situ Ozone Sparge System for the  
Wiggins Property, 3454 Santa Rosa Avenue, Santa Rosa, California**

Dear Mr. Dunaway:

At the request of our client, Mr. Floyd Wiggins representing Wiggins Enterprises, Winzler & Kelly Consulting Engineers (ENGINEER) is requesting a bid for the installation of an in-situ ozone sparge system at the above-referenced site.

Please review the enclosed Invitation to Bid and Project Specifications. Should you have any questions, please feel free to call me at (707) 523-1010.

Sincerely,  
WINZLER & KELLY

David J. Vossler  
Environmental Project Manager

sc

Enclosure: Invitation to Bid

March 18, 2005

Mr. Jeff Plum  
Plum Valley Environmental  
P.O. Box 632  
Red Bluff, CA 96080

**Re: Bid Solicitation for Installation of an In-Situ Ozone Sparge System for the  
Wiggins Property, 3454 Santa Rosa Avenue, Santa Rosa, California**

Dear Mr. Dunaway:

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Sincerely,  
WINZLER & KELLY

David J. Vossler  
Environmental Project Manager

sc

Enclosure: Invitation to Bid



March 18, 2005

Mr. Ed Kane  
The Geoservices Group  
874 Gravenstein Hwy South #12  
Sebastopol, CA 95472

**Re: Bid Solicitation for Installation of an In-Situ Ozone Sparge System for the  
Wiggins Property, 3454 Santa Rosa Avenue, Santa Rosa, California**

Dear Mr. Dunaway:

At the request of our client, Mr. Floyd Wiggins representing Wiggins Enterprises, Winzler & Kelly Consulting Engineers (ENGINEER) is requesting a bid for the installation of an in-situ ozone sparge system at the above-referenced site.

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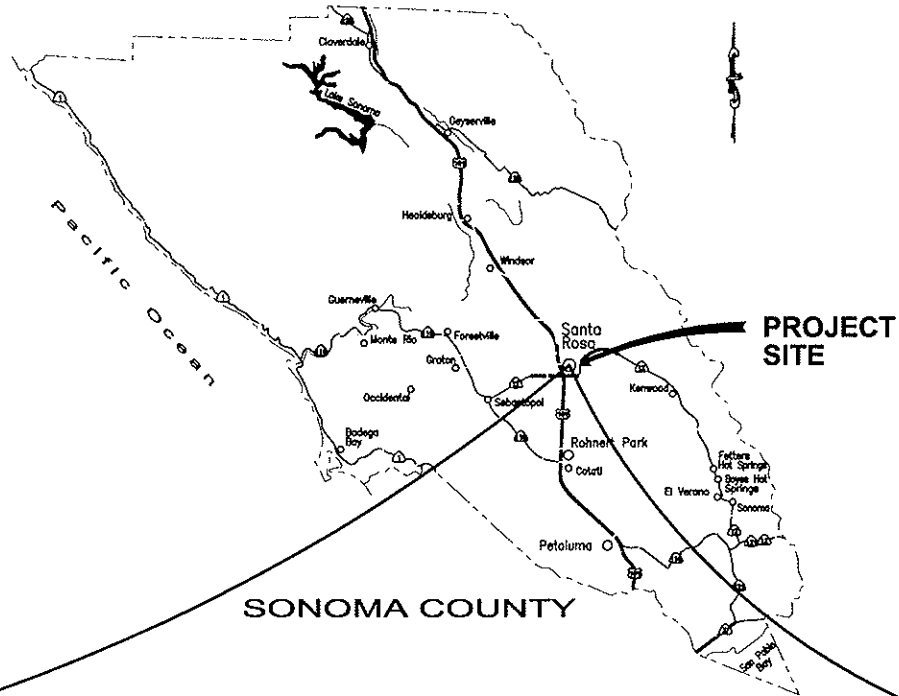
Sincerely,  
WINZLER & KELLY

David J. Vossler  
Environmental Project Manager

sc

Enclosure: Invitation to Bid

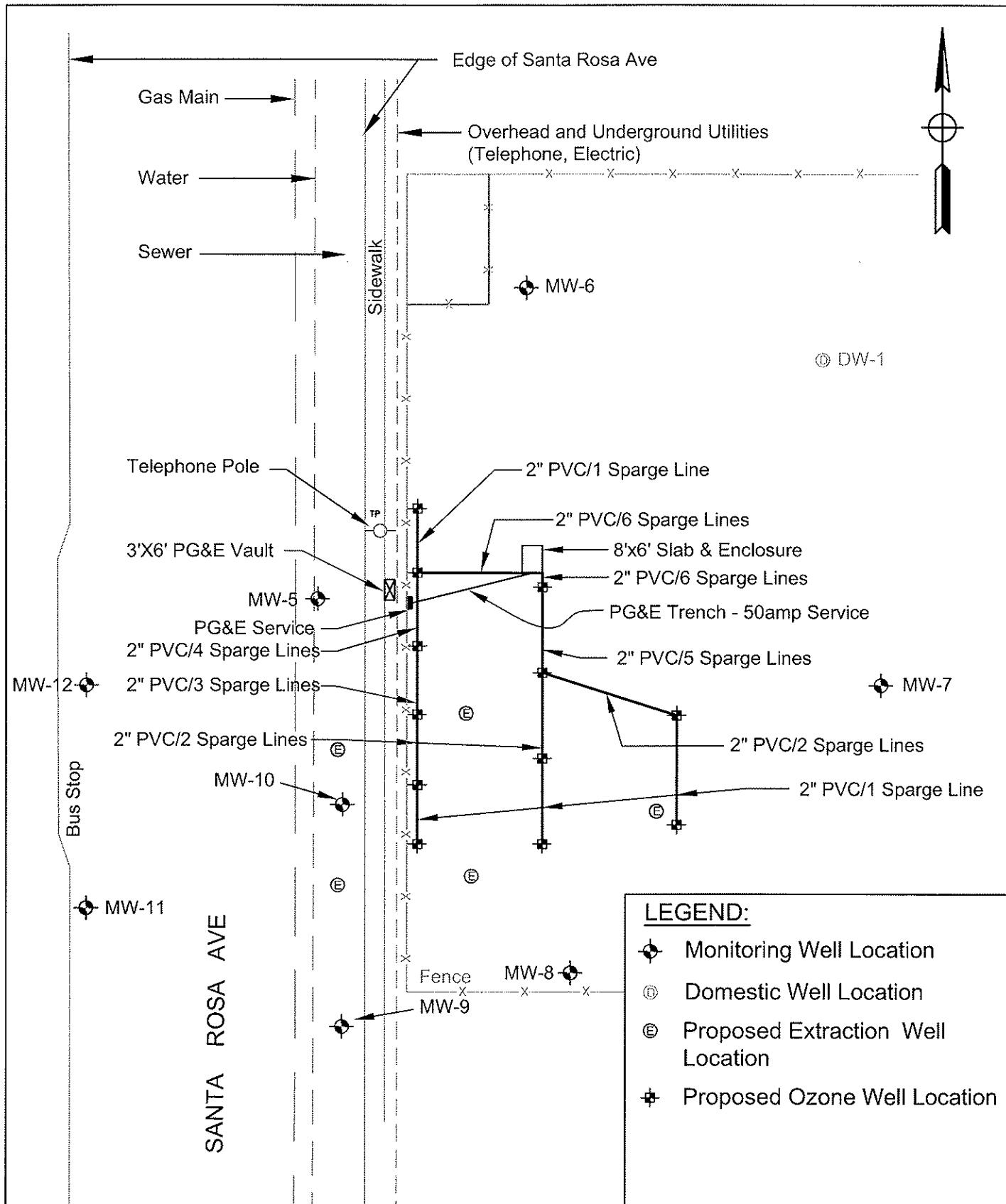




WIGGINS PROPERTY  
3454 Santa Rosa Ave  
Santa Rosa, California

LOCATION MAP  
FIGURE C-1

j:\04\259801\CAD\005\Sparge Piping plan.dwg Mar 09, 2005 - 9:56am



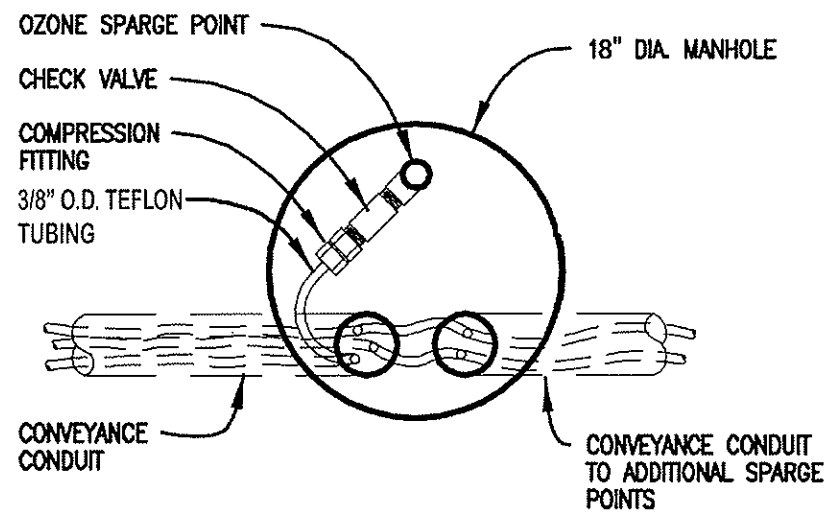
#### LEGEND:

- Monitoring Well Location
- Domestic Well Location
- Proposed Extraction Well Location
- Proposed Ozone Well Location

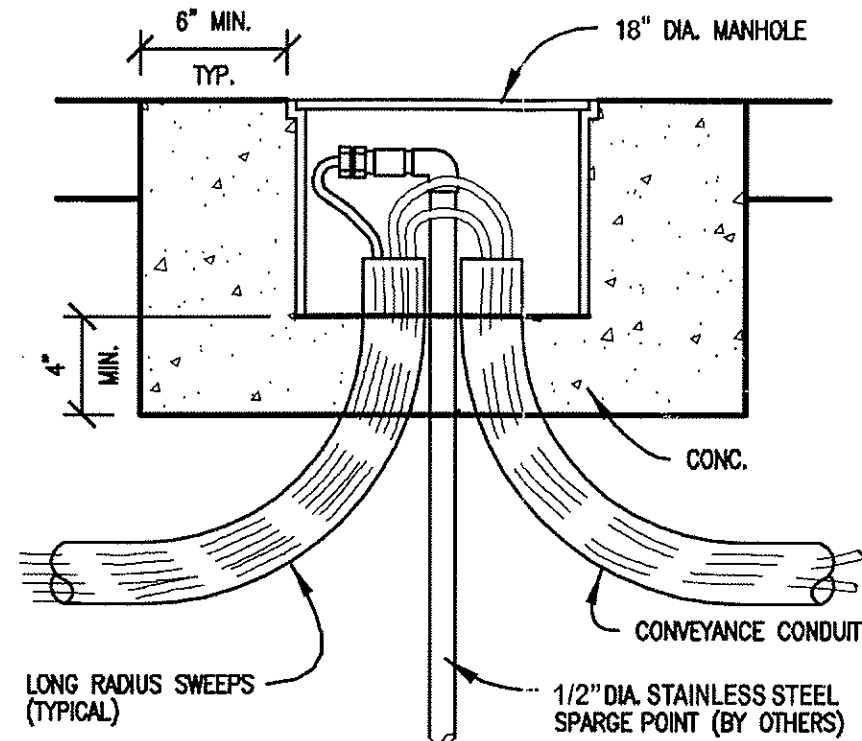
#### PROPOSED OZONE SPARGE & EXTRACTION WELL PIPING PLAN FIGURE C-2

WINZLER & KELLY  
CONSULTING ENGINEERS

WIGGINS PROPERTY  
3454 Santa Rosa Ave  
Santa Rosa, California

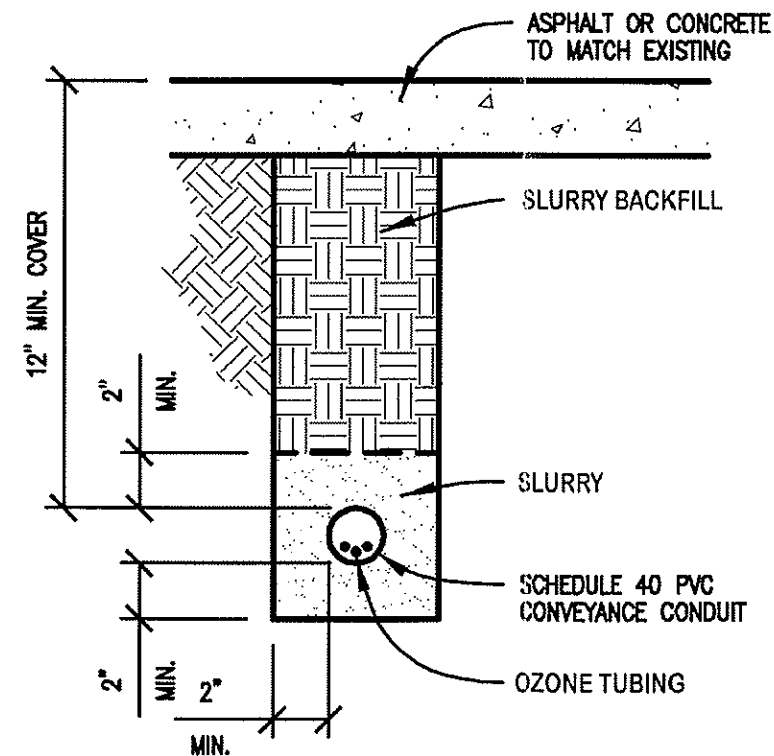


**TYPICAL OZONE SPARGE POINT - PLAN VIEW**  
NOT TO SCALE

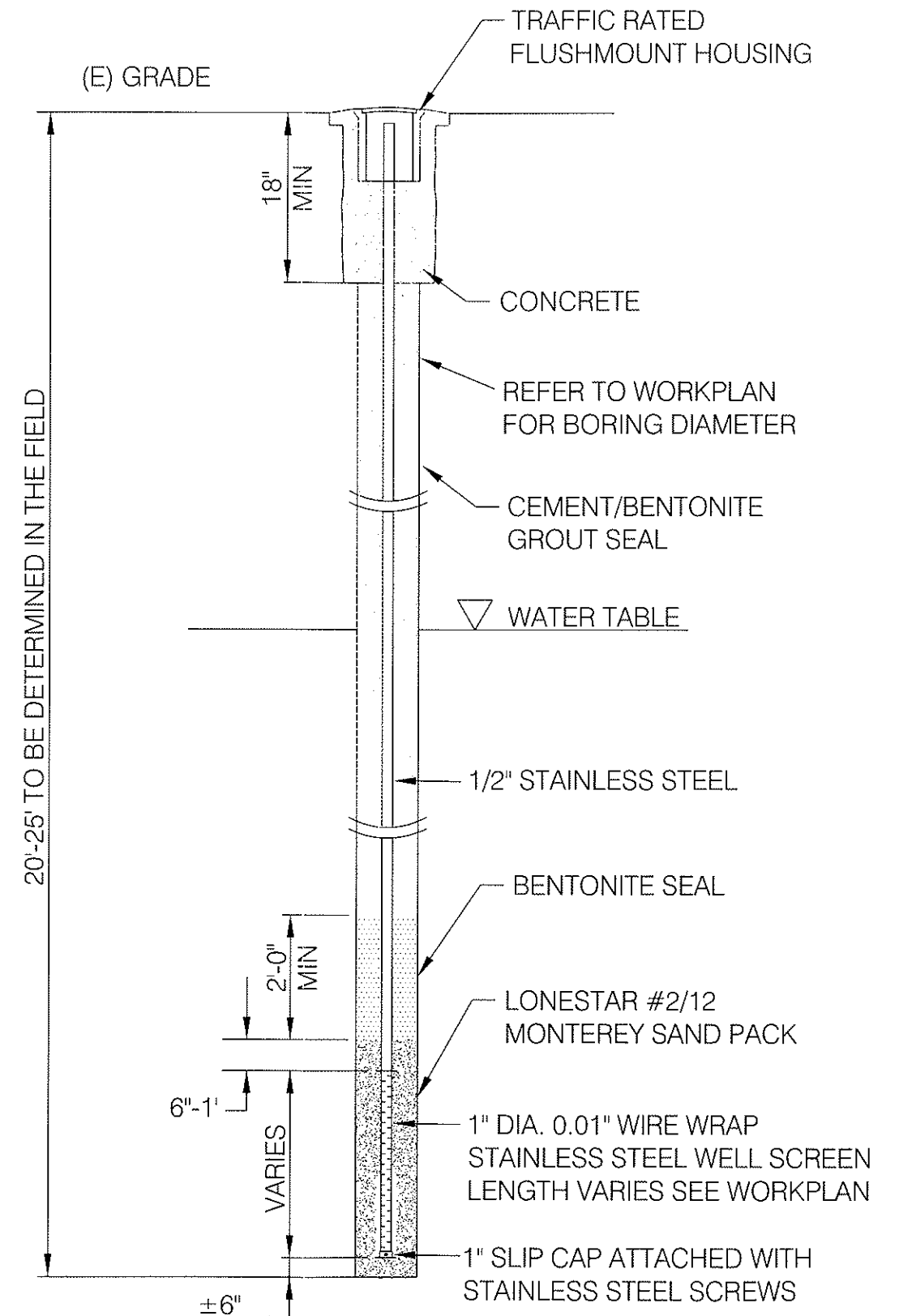


**TYPICAL OZONE SPARGE POINT - CROSS SECTION VIEW**  
NOT TO SCALE

**SEE ATTACHMENT A - FIGURE 2 FOR  
TYPICAL OZONE SPARGE POINT - CONNECTION**  
NOT TO SCALE

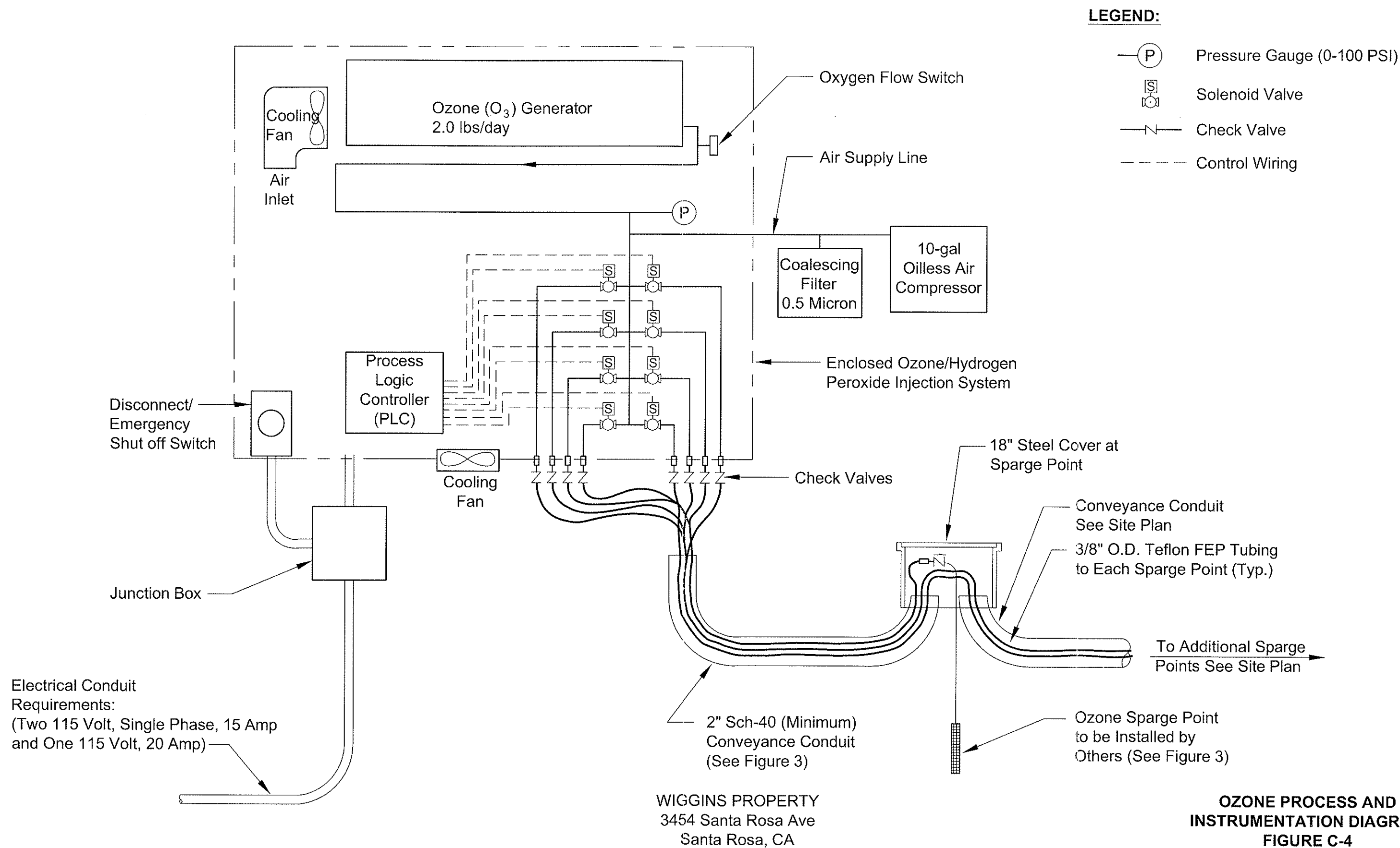


**TYPICAL TRENCH DETAIL - IN PAVEMENT**  
NOT TO SCALE



**TYPICAL OZONE SPARGE POINT  
CONSTRUCTION DETAIL**  
WIGGINS PROPERTY  
3454 SANTA ROSA PROPERTY  
SANTA ROSA, CA  
**FIGURE C-3**

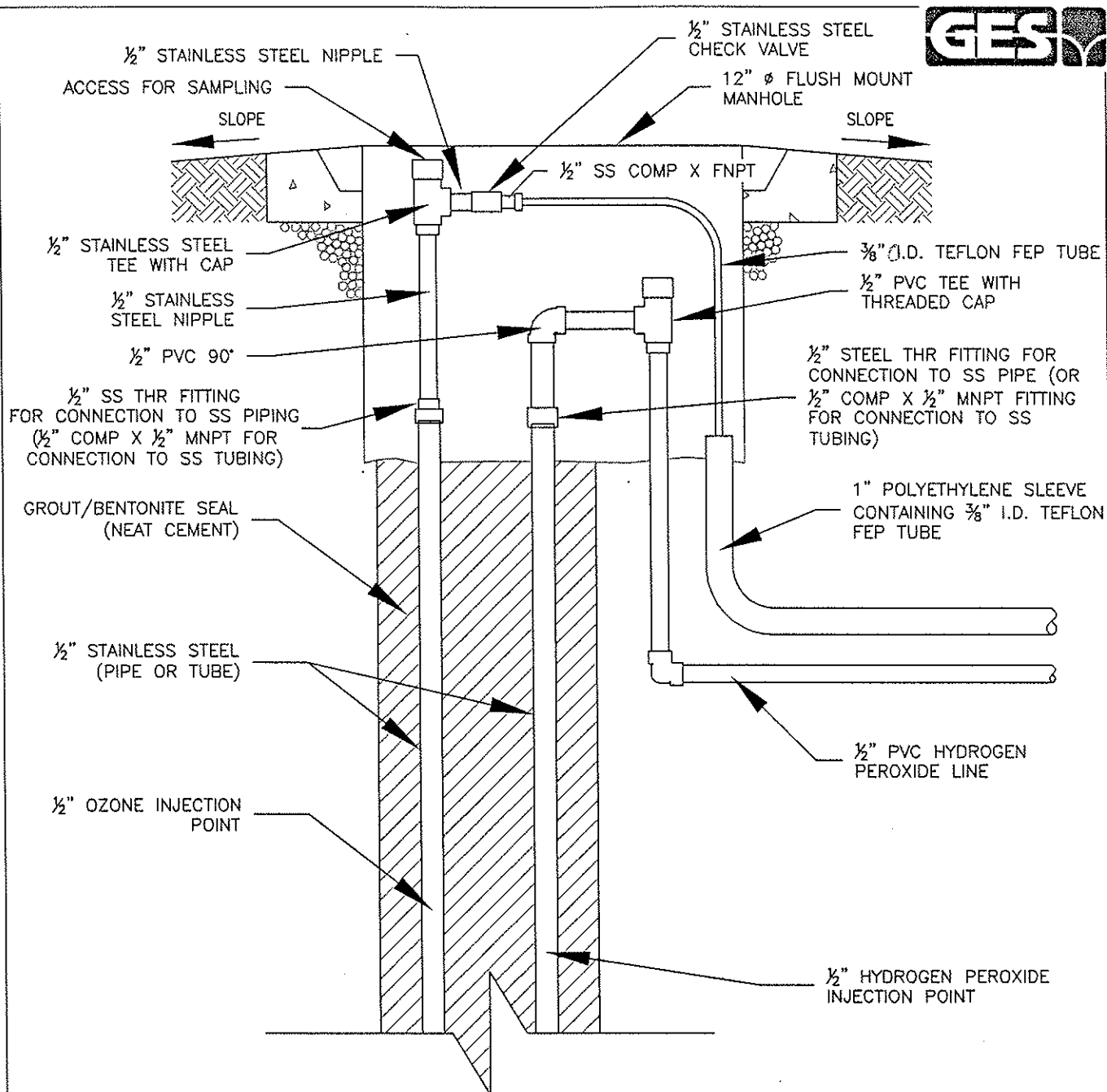
J:\04\259801\CAD\005\Sparging Schematic.dwg Mar 09, 2005 - 10:17am



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## **Attachment A**

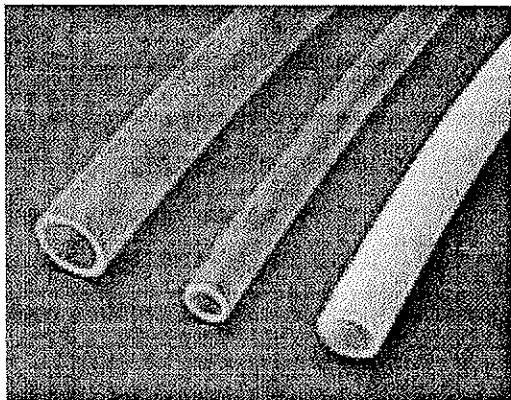
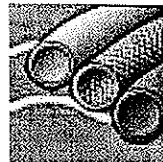
### **Specified Parts**



<p>CONFIDENTIALITY NOTE:</p> <p>INFORMATION CONTAINED WITHIN THIS DRAWING IS PROPRIETARY AND CONFIDENTIAL. ANY COPYING, DISTRIBUTION, OR DISSEMINATION WITHOUT THE CONSENT OF GROUNDWATER &amp; ENVIRONMENTAL SERVICES, INC. IS PROHIBITED.</p>	DRAFTED BY: TP (EXTON)	MAX-OX INJECTION WELL VAULT DETAIL		
	CHECKED BY: DNB	SITE		
	REVIEWED BY: CBW			
		Groundwater & Environmental Services, Inc. 410 EAGLEVIEW BOULEVARD, SUITE 110, EXTON, PA 19341		
		NOT TO SCALE	DATE 05-26-04	FIGURE 2



# FLUOROPOLYMER TEFLON TUBING



## FLUOROPOLYMER TUBINGS

### FEATURES

- Choose from tubings made from three different fluoropolymers, including Teflon® resin.
- Inertness to virtually all chemicals and solvents.
- Ultra-purity, non-contamination; containing no plasticizers or additives.
- The widest temperature capability of any plastic tubing.
- A non-stick, smooth surface, minimizing problems of absorption or adsorption.
- FDA compliancy.

### APPLICATIONS

- Ultra-pure systems.
- Semiconductor processing and chemical handling.
- Biotechnical and pharmaceutical applications.
- Sterilization systems which utilize intense ultraviolet radiation.
- Systems with temperature from cryogenic to 400°F.

### PHYSICAL PROPERTIES

TYPICAL PHYSICAL PROPERTIES	PFA	FEP	PTFE
Chemical resistance (See Engineering Section)	Excellent	Excellent	Excellent
Color	Transparent	Clear	Translucent
Durometer hardness, Shore D	60	55	58
Elongation @ 73°F	300%	275%	250%
Max. service temp., °F (°C)	500 (260)	400 (204)	550 (288)
Melting point, °F (°C)	575-590 (302-310)	500-530 (260-277)	621 (327)*
Low temperature Embrittlement, °F (°C)	-320 (-196)	-100 (-073)	-450 (-268)
Specific gravity	2.17	2.17	2.18
Dielectric strength, V/mil (kV/mm)(thickness)		2,000 (78.5)	
Odor and taste		None	
Toxicity		None	
Flammability	UL 94 rated V-0 (Self-extinguishing)		

\*Gel point -PTFE will not melt flow.

### SUBSTITUTE ITEMS

- Also available in Kynar.
- HP 440 and HP 450 high purity PFA resin based tubing is available upon special request. See page 86 or contact your local Ryan Herco Service Center for more details.

Clarity and temperature capabilities are the primary factors that differentiate these quality tubings:

**PFA tubing** is transparent for easy flow-monitoring and is the least permeable. Its temperature range is -320°F to 500°F. PFA tubing demonstrates the greatest physical property retention at high temperatures.

**PTFE tubing** is translucent and has the widest temperature capability of all tubings, -450°F to 550°F. It is superior for cryogenic applications and is the most flexible of the three tubings.

**FEP tubing** is clear for excellent visibility and has the best abrasion resistance of this tubing group. Its temperature service range is -100°F to 400°F.

### RECOMMENDED MAXIMUM OPERATING PRESSURE

Dia. (in.)		Min. Bend Radius at Room Temp. (in.)	212°F (100°C)		
			PTFE	FEP	PFA
1/16	1/8	1/2	180	148	190
1/8	1/4	1/2	182	150	192
5/32	1/4	3/4	126	104	133
3/16	1/4	1	77	64	81
3/16	5/16	1/2	136	112	143
1/4	5/16	1-3/4	61	50	64
1/4	3/8	1	109	90	115
5/16	3/8	2-1/2	49	41	52
3/8	1/2	2	42	35	45
7/16	1/2	4	36	30	38
1/2	5/8	3	61	50	64
9/16	5/8	5-1/2	29	23	30
5/8	3/4	6	50	41	52
11/16	3/4	8	24	19	25

This tubing has a safety factor of 4 to 1 (ratio of burst pressure to working pressure).

010.210.110	PTFE
010.190.110	FEP
010.200.120	PFA

### ORDER INFORMATION:

0317.(Size No.) PFA TUBING

0318.(Size No.) PTFE TUBING

0319.(Size No.) FEP TUBING

Size No.	Nom. I.D. (in.)	Nom. O.D. (in.)	Nom. Wall Thick. (in.)	Price Per Foot (50 ft. coils minimum order)					
				PFA		PTFE		FEP	
				50-500 ft.	550-1000 ft.	50-500 ft.	550-1000 ft.	50-500 ft.	550-1000 ft.
013	1/16	1/8	.030	\$ .65	\$ .54	\$ .45	\$ .38	\$ .48	\$ .40
037	1/8	1/4	.063	2.29	1.91	1.60	1.33	1.80	1.50
043	5/32	1/4	.047	2.00	1.67	1.25	1.04	1.50	1.25
050	3/16	1/4	.030	1.30	1.08	.85	.71	1.02	.85
051	3/16	5/16	.063	3.06	2.55	2.20	1.83	3.65	3.04
069	1/4	5/16	.030	1.66	1.39	1.25	1.04	1.30	1.08
071	1/4	3/8	.063	3.83	3.19	2.75	2.29	2.85	2.38
091	5/16	3/8	.030	2.03	1.69	1.60	1.33	1.59	1.33
107	3/8	1/2	.063	5.18	4.31	4.25	3.54	3.78	3.15
120	7/16	1/2	.030	2.77	2.30	3.35	2.79	2.17	1.81
135	1/2	5/8	.063	6.90	5.75	10.85	9.04	5.41	4.51
149	9/16	5/8	.030	8.83	7.35	4.50	3.75	4.63	3.85
163	5/8	3/4	.063	8.42	7.01	14.68	12.23	6.60	5.50
171	11/16	3/4	.030	4.24	3.63	6.80	4.83	3.33	2.77



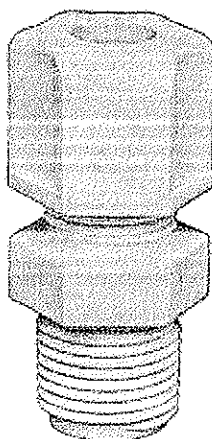
1-800-848-1141  
www.ryanherco.com



Home▼ Products▼ Industries▼ Customer Service▼ About Ryan Herco▼ Search▼

PRODUCT INDEX > TUBING & TUBE FITTINGS > TUBING - TUBING & HOSE FITTINGS > COMPRESSION FITTINGS (FOR HARD TUBING) > COMPRESSION FITTINGS, NATURAL PVDF

## ECONOMICAL TUBE FITTINGS



*Images shown are representative of the product family. Materials, sizes, and configurations may vary.*



### MORE INFORMATION:

- [Ryan Herco Product Guide Page \(.pdf\)](#)

### FEATURES

- Simple to install: Just cut the tubing end square, insert into the fitting without disassembling, and tighten ferrule nut for seal—no flaring is required.
- Molded of unpigmented Kynar (PVDF).
- Outstanding chemical resistance.
- With soft tubings like Tygon, 0657 insert should be added.
- High-quality fittings.
- Leakproof and corrosion-proof.
- Simple to install: Simply cut the tubing square, insert it into the fitting (without disassembling) and tighten ferrule nut to seal.
- Requires no flaring.
- Molded of white Polypropylene.

### APPLICATIONS

- For use with Teflon PTFE, FEP, and PFA tubing as well as with other plastic and stainless steel tubings.
- Highly corrosive fluids.
- Ultra-pure solutions.
- Use with plastic, stainless steel, copper and other types of tubing.
- Perfect for most weak acids and alkalies up to 225°F.
- Below 175°F the fittings have good resistance to organic solvents.

### ACCESSORY ITEMS

- Compression fittings, pages 88-96.
- Push-connect fittings, pages 93-97.

### SUBSTITUTE ITEMS

- Tubing valves, pages 74-75.

### ORDER: COMPRESSION FITTINGS, NATURAL PVDF

Part Number	Mfr. Part Number	Description	Price (USD)
0602.030		MALE CONN 1/8"OD X 1/8"MT PVDF	\$2.51
0602.031		MALE CONN 1/4"OD X 1/8"MT PVDF	\$3.00
0602.033		MALE CONN 1/4"OD X	\$3.14

	1/4"MT PVDF	
0602.035	MALE CONN 1/4"OD X 3/8"MT PVDF	\$3.70
0602.041	MALE CONN 5/16"OD X 1/8"MT PVDF	\$3.31
0602.043	MALE CONN 5/16"OD X 1/4"MT PVDF	\$3.39
0602.051	MALE CONN 3/8"OD X 1/8"MT PVDF	\$4.47
0602.053	MALE CONN 3/8"OD X 1/4"MT PVDF	\$4.60
0602.055	MALE CONN 3/8"OD X 3/8"MT PVDF	\$4.80
0602.056	MALE CONN 3/8"OD X 1/2"MT PVDF	\$5.43
0602.061	MALE CONN 1/2"OD X 1/8"MT PVDF	\$5.01
0602.063	MALE CONN 1/2"OD X 1/4"MT PVDF	\$6.08
0602.065	MALE CONN 1/2"OD X 3/8"MT PVDF	\$5.49
0602.066	MALE CONN 1/2"OD X 1/2"MT PVDF	\$5.85
0602.075	MALE CONN 5/8"OD X 3/8"MT PVDF	\$6.94
0602.076	MALE CONN 5/8"OD X 1/2"MT PVDF	\$7.24
0602.086	MALE CONN 3/4"OD X 1/2"MT PVDF	\$10.21
0602.088	MALE CONN 3/4"OD X 3/4"MT PVDF	\$10.53
0602.098	MALE CONN 7/8"OD X 3/4"MT PVDF	\$11.55
0602.231	MALE CONN 1/4"OD X 1/8"MT PVDF	\$2.87
0602.233	MALE CONN 1/4"OD X 1/4"MT PVDF	\$3.01
0602.253	MALE CONN 3/8"OD X 1/4"MT PVDF	\$4.54
0602.256	MALE CONN 3/8"OD X 1/2"MT PVDF	\$5.38
0602.266	MALE CONN 1/2"OD X 1/2" MT PVDF	\$6.45
0602.531	MALE CONN 1/4"OD X 1/8"MT PVDF	\$3.00
0602.533	MALE CONN 1/4"OD X 1/4"MT PVDF	\$3.14
0602.551	MALE CONN 3/8"OD X 1/8"MT PVDF	\$4.47
0602.553	MALE CONN 3/8"OD X	\$4.60

	1/4"MT PVDF	
0602.555	MALE CONN 3/8"OD X 3/8"MT PVDF	\$4.80
0602.556	MALE CONN 3/8"OD X 1/2"MT PVDF	\$5.43
0602.566	MALE CONN 1/2"OD X 1/2"MT PVDF	\$5.85
0602.576	MALE CONN 5/8"OD X 1/2"MT PVDF	\$7.24
0607.031	FEM CONN 1/4"OD X 1/8" T PVDF	\$3.00
0607.033	FEM CONN 1/4"OD X 1/4" T PVDF	\$3.25
0607.043	FEM CONN 5/16"OD X 1/4" T PVDF	\$3.51
0607.053	FEM CONN 3/8"OD X 1/4" T PVDF	\$4.60
0607.055	FEM CONN 3/8"OD X 3/8" T PVDF	\$4.65
0607.056	FEM CONN 3/8"OD X 1/2" T PVDF	\$5.29
0607.065	FEM CONN 1/2"OD X 3/8" T PVDF	\$5.38
0607.066	FEM CONN 1/2"OD X 1/2" T PVDF	\$5.72
0607.076	FEM CONN 5/8"OD X 1/2" T PVDF	\$6.70
0607.253	FEM CONN 3/8"OD X 1/4" T PVDF	\$4.54
0607.531	FEM CONN 1/4"OD X 1/8" T PVDF	\$3.00
0607.533	FEM CONN 1/4"OD X 1/4" T PVDF	\$3.25
0607.553	FEM CONN 3/8"OD X 1/4" T PVDF	\$4.60
0607.566	FEM CONN 1/2"OD X 1/2" T PVDF	\$5.72
0612.033	UNION CONN 1/4"OD X 1/4"OD PVDF	\$4.11
0612.043	UNION CONN 5/16"OD X 1/4"OD PVDF	\$4.30
0612.044	UNION CONN 5/16"OD X 5/16OD PVDF	\$4.92
0612.053	UNION CONN 3/8"OD X 1/4"OD PVDF	\$5.63
0612.055	UNION CONN 3/8"OD X 3/8"OD PVDF	\$6.64
0612.065	UNION CONN 1/2"OD X 3/8"OD PVDF	\$7.90
0612.066	UNION CONN 1/2"OD X	\$8.33

	1/2"OD PVDF	
0612.075	UNION CONN 5/8"OD X 3/8"OD PVDF	\$9.00
0612.076	UNION CONN 5/8"OD X 1/2"OD PVDF	\$9.55
0612.077	UNION CONN 5/8"OD X 5/8"OD PVDF	\$10.26
0612.088	UNION CONN 3/4"OD X 3/4"OD PVDF	\$13.24
0612.097	UNION CONN 7/8"OD X 5/8"OD PVDF	\$14.22
0612.099	UNION CONN 7/8"OD X 7/8"OD PVDF	\$15.21
0612.231	UNION CONN 1/4"OD X 1/8"OD PVDF	\$3.55
0612.244	UNION CONN 5/16"OD X 5/16OD PVDF	\$4.65
0612.255	UNION CONN 3/8"OD X 3/8"OD PVDF	\$6.53
0612.533	UNION CONN 1/4"OD X 1/4"OD PVDF	\$4.11
0612.553	UNION CONN 3/8"OD X 1/4"OD PVDF	\$5.63
0612.565	UNION CONN 1/2"OD X 3/8"OD PVDF	\$7.90
0612.577	UNION CONN 5/8"OD X 5/8"OD PVDF	\$10.26
0612.931	UNION CONN 1/4"OD X 1/8"OD PVDF	\$3.55
0612.932	SPCL ASSY CONSISTING OF 1 EACH:	\$5.49
0617.033	BKHD CONN 1/4"OD X 1/4"OD PVDF	\$5.54
0617.044	BKHD CONN 5/16"OD X 5/16"OD PVDF	\$6.05
0617.055	BKHD CONN 3/8"OD X 3/8"OD PVDF	\$8.59
0617.066	BKHD CONN 1/2"OD X 1/2"OD PVDF	\$9.89
0617.088	BKHD CONN 3/4"OD X 3/4"OD PVDF	\$14.92
0617.233	BKHD CONN 1/4"OD X 1/4"OD PVDF	\$5.30
0617.255	BKHD CONN 3/8"OD X 3/8"OD PVDF	\$8.48
0617.933	BKHD CONN 1/4"OD X 1/4"OD PVDF	\$5.30
0622.031	MALE BR TEE 1/4"OD X 1/8"MT PVDF	\$4.37

0622.033	MALE BR TEE 1/4"OD X 1/4"MT PVDF	\$4.54
0622.043	MALE BR TEE 5/16OD X 1/4"MT PVDF	\$4.98
0622.053	MALE BR TEE 3/8"OD X 1/4"MT PVDF	\$7.29
0622.055	MALE BR TEE 3/8"OD X 3/8"MT PVDF	\$7.41
0622.065	MALE BR TEE 1/2"OD X 3/8"MT PVDF	\$9.15
0622.066	MALE BR TEE 1/2"OD X 1/2"MT PVDF	\$9.76
0622.076	MALE BR TEE 5/8"OD X 1/2"MT PVDF	\$12.38
0622.086	MALE BR TEE 3/4"OD X 1/2"MT PVDF	\$18.93
0622.088	MALE BR TEE 3/4"OD X 3/4"MT PVDF	\$19.13
0622.098	MALE BR TEE 7/8"OD X 3/4"MT PVDF	\$21.45
0622.533	MALE BR TEE 1/4"OD X 1/4"MT PVDF	\$4.54
0627.033	UNION TEE 1/4"OD PVDF	\$5.49
0627.044	UNION TEE 5/16"OD PVDF	\$6.14
0627.055	UNION TEE 3/8"OD PVDF	\$9.35
0627.066	UNION TEE 1/2"OD PVDF	\$11.62
0627.070	UNION TEE 5/8"OD PVDF	\$15.10
0627.075	UNION TEE 5/8"OD X 3/8"OD PVDF	\$14.42
0627.088	UNION TEE 3/4"OD PVDF	\$27.27
0627.099	UNION TEE 7/8"OD PVDF	\$30.26
0627.131	UNION TEE 1/8"OD PVDF	\$4.24
0627.533	UNION TEE 1/4"OD PVDF	\$5.49
0627.566	UNION TEE 1/2"OD PVDF	\$11.62
0632.031	MALE RUN TEE 1/4"OD X 1/8MT PVDF	\$4.37
0632.033	MALE RUN TEE 1/4"OD X 1/4MT PVDF	\$4.54
0632.043	MALE RUN TEE 5/16OD X 1/4MT PVDF	\$5.01

0632.053	MALE RUN TEE 3/8"OD X 1/4MT PVDF	\$7.29
0632.055	MALE RUN TEE 3/8"OD X 3/8MT PVDF	\$7.43
0632.065	MALE RUN TEE 1/2"OD X 3/8MT PVDF	\$9.15
0632.066	MALE RUN TEE 1/2"OD X 1/2MT PVDF	\$9.76
0632.076	MALE RUN TEE 5/8"OD X 1/2MT PVDF	\$12.38
0632.086	MALE RUN TEE 3/4"OD X 1/2MT PVDF	\$18.93
0632.088	MALE RUN TEE 3/4"OD X 3/4MT PVDF	\$19.13
0632.098	MALE RUN TEE 7/8"OD X 3/4MT PVDF	\$21.45
0632.553	MALE RUN TEE 3/8"OD X 1/4MT PVDF	\$7.29
0632.565	MALE RUN TEE 1/2"OD X 3/8MT PVDF	\$9.15
0634.001	FERR NUT 1/8" OD PVDF K-O-2	\$1.48
0634.003	FERR NUT 1/4" OD PVDF K-O-4	\$1.82
0634.503	STEEL GRIPPER NUT 1/4" K-SG-4	\$2.04
0634.603	BKHD NUT 1/4" K-O-4B	\$2.04
0637.031	MALE EL 1/4"OD X 1/8"MT PVDF	\$3.17
0637.033	MALE EL 1/4"OD X 1/4"MT PVDF	\$3.25
0637.035	MALE EL 1/4"OD X 3/8"MT PVDF	\$4.85
0637.041	MALE EL 5/16"OD X 1/8"MT PVDF	\$3.45
0637.043	MALE EL 5/16"OD X 1/4"MT PVDF	\$3.67
0637.053	MALE EL 3/8"OD X 1/4"MT PVDF	\$4.71
0637.055	MALE EL 3/8"OD X 3/8"MT PVDF	\$4.80
0637.063	MALE EL 1/2"OD X 1/4"MT PVDF	\$5.52
0637.065	MALE EL 1/2"OD X 3/8"MT PVDF	\$5.60
0637.066	MALE EL 1/2"OD X 1/2"MT PVDF	\$6.20
0637.075	MALE EL 5/8"OD X 3/8"MT PVDF	\$7.19
0637.076	MALE EL 5/8"OD X	\$7.18

	1/2"MT PVDF	
0637.130	MALE EL 1/8"OD X 1/8"MT PVDF	\$2.86
0637.231	MALE EL 1/4"OD X 1/8"MT PVDF	\$3.05
0637.233	MALE EL 1/4"OD X 1/4"MT PVDF	\$3.12
0637.266	MALE EL 1/2"OD X 1/2"MT PVDF	\$6.15
0637.531	MALE EL 1/4"OD X 1/8"MT PVDF	\$3.17
0637.533	MALE EL 1/4"OD X 1/4"MT PVDF	\$3.25
0637.553	MALE EL 3/8"OD X 1/4"MT PVDF	\$4.71
0637.555	MALE EL 3/8"OD X 3/8"MT PVDF	\$4.80
0642.033	UNION EL 1/4"OD PVDF	\$4.11
0642.044	UNION EL 5/16"OD PVDF	\$4.51
0642.055	UNION EL 3/8"OD PVDF	\$6.64
0642.066	UNION EL 1/2"OD PVDF	\$8.55
0642.070	UNION EL 5/8"OD PVDF	\$10.32
0642.099	UNION EL 7/8"OD PVDF	\$18.80
0642.533	UNION EL 1/4"OD PVDF	\$4.11
0642.555	UNION EL 3/8"OD PVDF	\$6.64
0642.566	UNION EL 1/2"OD PVDF	\$8.55
0647.031	FEM EL 1/4"OD X 1/8"OD PVDF	\$3.30
0647.033	FEM EL 1/4"OD X 1/4"OD PVDF	\$3.48
0647.043	FEM EL 5/16"OD X 1/4"OD PVDF	\$3.81
0647.053	FEM EL 3/8"OD X 1/4"OD PVDF	\$4.88
0647.055	FEM EL 3/8"OD X 3/8"OD PVDF	\$5.01
0647.065	FEM EL 1/2"OD X 3/8"OD PVDF	\$6.20
0647.066	FEM EL 1/2"OD X 1/2"OD PVDF	\$6.57
0647.076	FEM EL 5/8"OD X 1/2"OD PVDF	\$7.55



PVDF			
0647.531	FEM EL 1/4"OD X 1/8"T PVDF	\$3.30	
0647.553	FEM EL 3/8"OD X 1/4"T PVDF	\$4.88	
0647.555	FEM EL 3/8"OD X 3/8"T PVDF	\$5.01	
0652.003	GRPR NUT 1/4"OD PVDF K-PG-4	\$2.04	
0652.004	GRPR NUT 5/16"OD PVDF K-PG-5	\$2.28	
0652.005	GRPR NUT 3/8"OD PVDF K-PG-6	\$3.74	
0652.006	GRPR NUT 1/2"OD PVDF K-PG-8	\$4.50	
0652.007	GRPR NUT 5/8"OD PVDF K-PG-10	\$6.06	
0652.008	GRPR NUT 3/4"OD PVDF K-PG-12	\$8.50	
0652.009	GRPR NUT 7/8"OD PVDF K-PG-14	\$9.76	
0652.501	BLD GRPR NUT 1/8"OD PVDF	\$1.72	
0652.503	BLD GRPR NUT 1/4"OD PVDF	\$2.02	
0652.505	BLD GRPR NUT 3/8"OD PVDF	\$3.88	
0652.506	BLD GRPR NUT 1/2"OD PVDF	\$4.62	
0657.003	INS 1/4"OD PVDF	\$0.32	
0657.004	INS 5/16"OD PVDF	\$0.34	
0657.005	INS 3/8"OD PVDF	\$0.38	
0657.006	INS 1/2"OD PVDF	\$0.50	

List prices effective February 22, 2005 and subject to change. Contact Ryan Herco at 1-800-848-1141 for additional price information and minimum order quantities.

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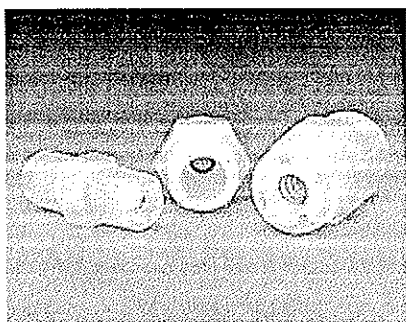
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## KYNAR CHECK VALVE



*Images shown are representative of the product family. Materials, sizes, and configurations may vary.*

### FEATURES

- Viton O-ring.
- Stainless Ball & Spring.
- Max. Operating Temp.
- 220 PSI @ 180°F.
- Cracking Pressure 1-2.5 PSI.
- Zero Leakage.
- Male Pipe NPTF Style.

### ORDER: TUBING SPRING CHECK VALVE

#### MORE INFORMATION:

- [Ryan Herco Product Guide Page \(.pdf\)](#)

Part Number	Mfr. Part Number	Description	Price (USD)
5162.001		PVDF CK VLV 1/8" T	\$8.73
5162.002		PVDF CK VLV 1/4" T	\$9.29
5162.003		PVDF CK VLV 3/8" T	\$9.90
5162.005		PVDF CK VLV 1/2" T	\$11.17
5162.902		PVDF/TFE CK VLV 1/4" T	\$10.29
5162.905		PVDF/TFE CK VLV 1/2" T	\$12.17

List prices effective February 22, 2005 and subject to change. Contact Ryan Herco at 1-800-848-1141 for additional price information and minimum order quantities.

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### Products

Product Information	
	<b>Part #:</b> SS-8-T-10K <b>Price:</b> Login to see pricing <b>Description:</b> Stainless Tee, 1/2 in. FNPT (10000 psi)
<a href="#">Click to Enlarge</a>	
<a href="#">Click the links below to view detailed product information (opens a new window)</a>	
<b>Product Specifications</b> Body Material: Stainless Steel Connection 1 Size: 1/2" Connection 1 Type: FEMALE NPT TAPER THREAD Connection 2 Size: 1/2" Connection 2 Type: FEMALE NPT TAPER THREAD Connection 3 Size: 1/2" Connection 3 Type: FEMALE NPT TAPER eClass: 37020556 UNSPSC Code: 40141729	
<b>Catalog Information (PDF)</b> <a href="#">Pipe Fittings - Complete Catalog</a>	
<b>Related Documents (PDF)</b> <a href="#">Swagelok Specification SC-10 - Standard Cleaning and Packaging</a> <a href="#">Thread and End Connection Identification Guide</a> <a href="#">Complete List of All Swagelok MSDS Referenced by Catalogs</a>	

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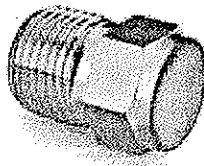


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#### Product Information



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**Part #:** SS-8-P  
**Price:** Login to see pricing  
**Description:** Stainless Pipe Plug, 1/2 in. MNPT

[Catalog](#)

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[Click the links below to view detailed product information \(opens a new window\)](#)

#### Product Specifications

Body Material: Stainless Steel  
 Connection 1 Size: 1/2"  
 Connection 1 Type: MALE NPT TAPER THREAD  
 eClass: 37020572  
 Fitting Type: Pipe Plug  
 UNSPSC Code: 40141706

#### Catalog Information (PDF)

[Pipe Fittings - Complete Catalog](#)

#### Related Documents (PDF)

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[Thread and End Connection Identification Guide](#)

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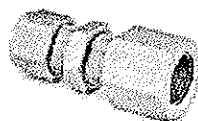
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#### Product Information



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**Part #:** SS-810-71-8  
**Price:** Login to see pricing  
**Description:** Stainless Bulkhead Female Connector, 1/2 in. OD - 1/2 in. FNPT

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#### Product Specifications

Body Material: Stainless Steel  
 Connection 1 Size: 1/2"  
 Connection 1 Type: TUBE FITTING  
 Connection 2 Size: 1/2"  
 Connection 2 Type: FEMALE NPT TAPER THREAD  
 eClass: 37020719  
 UNSPSC Code: 40141720

#### Catalog Information (PDF)

[Gageable Tube Fittings and Adapter Fittings 1/16" - 2", 2mm - 38mm - Complete Catalog](#)

#### Related Documents (PDF)

- [Special Alloy Fluid System Components](#)
- [Swagelok Specification SC-10 - Standard Cleaning and Packaging](#)
- [Swagelok Specification SC-11 - Special Cleaning and Packaging](#)
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## Dave Vossler

---

**From:** Stephen McAdams [smcadams@aptwater.com]  
**Sent:** Tuesday, February 01, 2005 5:35 PM  
**To:** Mike Goh  
**Cc:** Douglas Gustafson; jbrackin@tao-tech.com  
**Subject:** O-rings

Mike:

Dash size 111 is a standard size that Victor should be familiar with, 3/32" diameter x 7/16"ID x 5/8"OD. See attached chart.

Stephen McAdams  
VP Manufacturing & Engineering  
Applied Process Technology, Inc.  
3333 Vincent Road, Suite 222  
Pleasant Hill, CA 94523  
Phone: 925-977-1811 ext. 303  
Fax: 925-977-1818  
E-mail: smcadams@aptwater.com

---

**From:** Mike Goh [mailto:mgoh@stratusinc.net]  
**Sent:** Tuesday, February 01, 2005 4:09 PM  
**To:** Stephen McAdams  
**Subject:** RE: Check Valves

I called Victor, the engineer with Pacific Rubber and Seal. He needs to know the thickness of the Kalrez O-ring. Do you have that info?

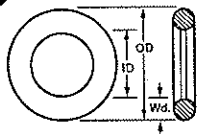
My teflon tubings for ozone will be 3/8" O.D. and 5/16" I.D. Ryan Herco part no. 0319-091  
My polyethylene tubing for hydrogen peroxide will be 1/4" O.D and 0.17" I.D.; Ryan Herco part no. 0535-616

Thanks,  
Mike Goh

---

Incoming mail is certified Virus Free.  
Checked by AVG anti-virus system (<http://www.grisoft.com>).  
Version: 6.0.830 / Virus Database: 565 - Release Date: 1/6/2005

2/16/2005



## O-Ring Sizing Chart

O-rings provide a reliable seal in static (axial and radial squeezed) and dynamic (reciprocating, oscillating, and rotary) applications. They're used for sealing cylinders, valves, faucets, flanges, compressors, engines, and boss tube fittings.

AS568A Dash No.	Fractional Size, ID × OD	Actual Size, ID × OD
Width: $\frac{1}{32}$ " Fractional (0.040" Actual)		
001	$\frac{1}{32}$ " × $\frac{3}{32}$ "	0.029" × 0.109"
002	$\frac{3}{64}$ " × $\frac{9}{64}$ "	0.042" × 0.142"
Width: $\frac{1}{16}$ " Fractional (0.070" Actual)		
003	$\frac{1}{16}$ " × $\frac{3}{16}$ "	0.056" × 0.176"
004	$\frac{5}{64}$ " × $\frac{13}{64}$ "	0.070" × 0.210"
005	$\frac{7}{64}$ " × $\frac{15}{64}$ "	0.101" × 0.241"
006	$\frac{1}{8}$ " × $\frac{1}{4}$ "	0.114" × 0.254"
007	$\frac{5}{32}$ " × $\frac{9}{32}$ "	0.145" × 0.285"
008	$\frac{3}{16}$ " × $\frac{5}{16}$ "	0.176" × 0.316"
009	$\frac{7}{32}$ " × $\frac{11}{32}$ "	0.208" × 0.348"
010	$\frac{1}{4}$ " × $\frac{3}{8}$ "	0.239" × 0.379"
011	$\frac{5}{16}$ " × $\frac{7}{16}$ "	0.301" × 0.441"
012	$\frac{3}{8}$ " × $\frac{1}{2}$ "	0.364" × 0.504"
013	$\frac{7}{16}$ " × $\frac{9}{16}$ "	0.426" × 0.566"
014	$\frac{1}{2}$ " × $\frac{5}{8}$ "	0.489" × 0.629"
015	$\frac{9}{16}$ " × $\frac{11}{16}$ "	0.551" × 0.691"
016	$\frac{5}{8}$ " × $\frac{3}{4}$ "	0.614" × 0.754"
017	$\frac{11}{16}$ " × $\frac{13}{16}$ "	0.676" × 0.816"
018	$\frac{3}{4}$ " × $\frac{7}{8}$ "	0.739" × 0.879"
019	$\frac{13}{16}$ " × $\frac{15}{16}$ "	0.801" × 0.941"
020	$\frac{7}{8}$ " × 1"	0.864" × 1.004"
021	$\frac{15}{16}$ " × $1\frac{1}{16}$ "	0.926" × 1.066"
022	1" × $1\frac{1}{8}$ "	0.989" × 1.129"
023	$1\frac{1}{16}$ " × $1\frac{3}{16}$ "	1.051" × 1.191"
024	$1\frac{1}{8}$ " × $1\frac{1}{4}$ "	1.114" × 1.254"
025	$1\frac{3}{16}$ " × $1\frac{5}{16}$ "	1.176" × 1.316"
026	$1\frac{1}{4}$ " × $1\frac{3}{8}$ "	1.239" × 1.379"

AS568A Dash No.	Fractional Size, ID × OD	Actual Size, ID × OD
Width: $\frac{1}{16}$ " Fractional (Cont.)		
027	$1\frac{5}{16}$ " × $1\frac{7}{16}$ "	1.301" × 1.441"
028	$1\frac{3}{8}$ " × $1\frac{1}{2}$ "	1.364" × 1.504"
029	$1\frac{1}{2}$ " × $1\frac{5}{8}$ "	1.489" × 1.629"
030	$1\frac{5}{8}$ " × $1\frac{3}{4}$ "	1.614" × 1.754"
031	$1\frac{3}{4}$ " × $1\frac{7}{8}$ "	1.739" × 1.879"
032	$1\frac{7}{8}$ " × 2"	1.864" × 2.004"
033	2" × $2\frac{1}{8}$ "	1.989" × 2.129"
034	$2\frac{1}{8}$ " × $2\frac{1}{4}$ "	2.114" × 2.254"
035	$2\frac{1}{4}$ " × $2\frac{3}{8}$ "	2.239" × 2.379"
036	$2\frac{3}{8}$ " × $2\frac{1}{2}$ "	2.364" × 2.504"
037	$2\frac{1}{2}$ " × $2\frac{5}{8}$ "	2.489" × 2.629"
038	$2\frac{5}{8}$ " × $2\frac{3}{4}$ "	2.614" × 2.754"
039	$2\frac{3}{4}$ " × $2\frac{7}{8}$ "	2.739" × 2.879"
040	$2\frac{7}{8}$ " × 3"	2.864" × 3.004"
041	3" × $3\frac{1}{8}$ "	2.989" × 3.129"
042	$3\frac{1}{4}$ " × $3\frac{3}{8}$ "	3.239" × 3.379"
043	$3\frac{1}{2}$ " × $3\frac{5}{8}$ "	3.489" × 3.629"
044	$3\frac{3}{4}$ " × $3\frac{7}{8}$ "	3.739" × 3.879"
045	4" × $4\frac{1}{8}$ "	3.989" × 4.129"
046	$4\frac{1}{4}$ " × $4\frac{3}{8}$ "	4.239" × 4.379"
047	$4\frac{1}{2}$ " × $4\frac{5}{8}$ "	4.489" × 4.629"
048	$4\frac{3}{4}$ " × $4\frac{7}{8}$ "	4.739" × 4.879"
049	5" × $5\frac{1}{8}$ "	4.989" × 5.129"
050	$5\frac{1}{4}$ " × $5\frac{3}{8}$ "	5.239" × 5.379"
051	$5\frac{1}{2}$ " × $5\frac{5}{8}$ "	5.489" × 5.629"
052	$5\frac{3}{4}$ " × $5\frac{7}{8}$ "	5.739" × 5.879"
053	6" × $6\frac{1}{8}$ "	5.989" × 6.129"

AS568A Dash No.	Fractional Size, ID × OD	Actual Size, ID × OD
Width: $\frac{1}{16}$ " Fractional (Cont.)		
054	$6\frac{1}{4}$ " × $6\frac{3}{8}$ "	6.239" × 6.379"
055	$6\frac{1}{2}$ " × $6\frac{5}{8}$ "	6.489" × 6.629"
Width: $\frac{3}{32}$ " Fractional (0.103" Actual)		
102	$\frac{1}{16}$ " × $\frac{1}{4}$ "	0.049" × 0.255"
103	$\frac{3}{32}$ " × $\frac{9}{32}$ "	0.081" × 0.287"
104	$\frac{1}{8}$ " × $\frac{5}{16}$ "	0.112" × 0.318"
105	$\frac{5}{32}$ " × $\frac{11}{32}$ "	0.143" × 0.349"
106	$\frac{3}{16}$ " × $\frac{3}{8}$ "	0.174" × 0.380"
107	$\frac{7}{32}$ " × $\frac{13}{32}$ "	0.206" × 0.412"
108	$\frac{1}{4}$ " × $\frac{7}{16}$ "	0.237" × 0.443"
109	$\frac{5}{16}$ " × $\frac{1}{2}$ "	0.299" × 0.505"
110	$\frac{3}{8}$ " × $\frac{9}{16}$ "	0.362" × 0.568"
111	$\frac{7}{16}$ " × $\frac{5}{8}$ "	0.424" × 0.630"
112	$\frac{1}{2}$ " × $1\frac{1}{16}$ "	0.487" × 0.693"
113	$\frac{9}{16}$ " × $\frac{3}{4}$ "	0.549" × 0.755"
114	$\frac{5}{8}$ " × $1\frac{1}{16}$ "	0.612" × 0.818"
115	$1\frac{1}{16}$ " × $\frac{7}{8}$ "	0.674" × 0.880"
116	$\frac{3}{4}$ " × $1\frac{5}{16}$ "	0.737" × 0.943"
117	$1\frac{3}{16}$ " × 1"	0.799" × 1.005"
118	$\frac{7}{8}$ " × $1\frac{1}{16}$ "	0.862" × 1.068"
119	$1\frac{5}{16}$ " × $1\frac{1}{8}$ "	0.924" × 1.130"
120	1" × $1\frac{3}{16}$ "	0.987" × 1.193"
121	$1\frac{1}{16}$ " × $1\frac{1}{4}$ "	1.049" × 1.255"
122	$1\frac{1}{8}$ " × $1\frac{5}{16}$ "	1.112" × 1.318"
123	$1\frac{3}{8}$ " × $1\frac{3}{8}$ "	1.174" × 1.380"
124	$1\frac{1}{4}$ " × $1\frac{7}{16}$ "	1.237" × 1.443"
125	$1\frac{5}{16}$ " × $1\frac{1}{2}$ "	1.299" × 1.505"

## O-Ring Sizing Chart (Cont.)

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{3}{32}$ " Fractional (Cont.)		
126	$1\frac{3}{8}" \times 1\frac{9}{16}"$	1.362" x 1.568"
127	$1\frac{1}{16}" \times 1\frac{5}{8}"$	1.424" x 1.630"
128	$1\frac{1}{2}" \times 1\frac{11}{16}"$	1.487" x 1.693"
129	$1\frac{9}{16}" \times 1\frac{3}{4}"$	1.549" x 1.755"
130	$1\frac{5}{8}" \times 1\frac{13}{16}"$	1.612" x 1.818"
131	$1\frac{11}{16}" \times 1\frac{7}{8}"$	1.674" x 1.880"
132	$1\frac{3}{4}" \times 1\frac{15}{16}"$	1.734" x 1.934"
133	$1\frac{13}{16}" \times 2"$	1.799" x 2.005"
134	$1\frac{7}{8}" \times 2\frac{1}{16}"$	1.862" x 2.068"
135	$1\frac{15}{16}" \times 2\frac{1}{8}"$	1.925" x 2.131"
136	$2" \times 2\frac{3}{16}"$	1.987" x 2.193"
137	$2\frac{1}{16}" \times 2\frac{1}{4}"$	2.050" x 2.256"
138	$2\frac{1}{8}" \times 2\frac{5}{16}"$	2.112" x 2.318"
139	$2\frac{3}{16}" \times 2\frac{3}{8}"$	2.175" x 2.381"
140	$2\frac{1}{4}" \times 2\frac{7}{16}"$	2.237" x 2.443"
141	$2\frac{5}{16}" \times 2\frac{1}{2}"$	2.300" x 2.506"
142	$2\frac{3}{8}" \times 2\frac{9}{16}"$	2.362" x 2.568"
143	$2\frac{7}{16}" \times 2\frac{5}{8}"$	2.425" x 2.631"
144	$2\frac{1}{2}" \times 2\frac{11}{16}"$	2.487" x 2.693"
145	$2\frac{9}{16}" \times 2\frac{3}{4}"$	2.550" x 2.756"
146	$2\frac{5}{8}" \times 2\frac{13}{16}"$	2.612" x 2.818"
147	$2\frac{11}{16}" \times 2\frac{7}{8}"$	2.675" x 2.881"
148	$2\frac{3}{4}" \times 2\frac{15}{16}"$	2.737" x 2.943"
149	$2\frac{13}{16}" \times 3"$	2.800" x 3.006"
150	$2\frac{7}{8}" \times 3\frac{1}{16}"$	2.862" x 3.068"
151	$3" \times 3\frac{3}{16}"$	2.987" x 3.193"
152	$3\frac{1}{4}" \times 3\frac{7}{16}"$	3.237" x 3.443"
153	$3\frac{1}{2}" \times 3\frac{11}{16}"$	3.487" x 3.693"
154	$3\frac{3}{4}" \times 3\frac{15}{16}"$	3.737" x 3.943"
155	$4" \times 4\frac{1}{16}"$	3.987" x 4.193"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{3}{32}$ " Fractional (Cont.)		
156	$4\frac{1}{4}" \times 4\frac{7}{16}"$	4.237" x 4.443"
157	$4\frac{1}{2}" \times 4\frac{1}{16}"$	4.487" x 4.693"
158	$4\frac{3}{4}" \times 4\frac{5}{16}"$	4.737" x 4.943"
159	$5" \times 5\frac{1}{16}"$	4.987" x 5.193"
160	$5\frac{1}{4}" \times 5\frac{7}{16}"$	5.237" x 5.443"
161	$5\frac{1}{2}" \times 5\frac{11}{16}"$	5.487" x 5.693"
162	$5\frac{3}{4}" \times 5\frac{15}{16}"$	5.737" x 5.943"
163	$6" \times 6\frac{1}{16}"$	5.987" x 6.193"
164	$6\frac{1}{4}" \times 6\frac{7}{16}"$	6.237" x 6.443"
165	$6\frac{1}{2}" \times 6\frac{11}{16}"$	6.487" x 6.693"
166	$6\frac{3}{4}" \times 6\frac{15}{16}"$	6.737" x 6.943"
167	$7" \times 7\frac{1}{16}"$	6.987" x 7.193"
168	$7\frac{1}{4}" \times 7\frac{7}{16}"$	7.237" x 7.443"
169	$7\frac{1}{2}" \times 7\frac{11}{16}"$	7.487" x 7.693"
170	$7\frac{3}{4}" \times 7\frac{15}{16}"$	7.737" x 7.943"
171	$8" \times 8\frac{1}{16}"$	7.987" x 8.193"
172	$8\frac{1}{4}" \times 8\frac{7}{16}"$	8.237" x 8.443"
173	$8\frac{1}{2}" \times 8\frac{11}{16}"$	8.487" x 8.693"
174	$8\frac{3}{4}" \times 8\frac{15}{16}"$	8.737" x 8.943"
175	$9" \times 9\frac{1}{16}"$	8.987" x 9.193"
176	$9\frac{1}{4}" \times 9\frac{7}{16}"$	9.237" x 9.443"
177	$9\frac{1}{2}" \times 9\frac{11}{16}"$	9.487" x 9.693"
178	$9\frac{3}{4}" \times 9\frac{15}{16}"$	9.737" x 9.943"
Width: $\frac{1}{8}$ " Fractional (0.139" Actual)		
201	$\frac{3}{16}" \times \frac{7}{16}"$	0.171" x 0.449"
202	$\frac{1}{4}" \times \frac{1}{2}"$	0.234" x 0.512"
203	$\frac{5}{16}" \times \frac{9}{16}"$	0.296" x 0.574"
204	$\frac{3}{8}" \times \frac{5}{8}"$	0.359" x 0.637"
205	$\frac{7}{16}" \times \frac{11}{16}"$	0.421" x 0.699"
206	$\frac{1}{2}" \times \frac{3}{4}"$	0.484" x 0.762"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{1}{8}$ " Fractional (Cont.)		
207	$\frac{9}{16}" \times \frac{13}{16}"$	0.546" x 0.824"
208	$\frac{5}{8}" \times \frac{7}{8}"$	0.609" x 0.887"
209	$1\frac{1}{16}" \times \frac{15}{16}"$	0.671" x 0.949"
210	$\frac{3}{4}" \times 1"$	0.734" x 1.012"
211	$1\frac{3}{16}" \times 1\frac{1}{16}"$	0.796" x 1.074"
212	$\frac{7}{8}" \times 1\frac{1}{8}"$	0.859" x 1.137"
213	$1\frac{5}{16}" \times 1\frac{3}{16}"$	0.921" x 1.199"
214	$1" \times 1\frac{1}{4}"$	0.984" x 1.262"
215	$1\frac{1}{16}" \times 1\frac{5}{16}"$	1.046" x 1.324"
216	$1\frac{1}{8}" \times 1\frac{3}{8}"$	1.109" x 1.387"
217	$1\frac{3}{16}" \times 1\frac{7}{16}"$	1.171" x 1.449"
218	$1\frac{1}{4}" \times 1\frac{1}{2}"$	1.234" x 1.512"
219	$1\frac{5}{16}" \times 1\frac{9}{16}"$	1.296" x 1.574"
220	$1\frac{3}{8}" \times 1\frac{5}{8}"$	1.359" x 1.637"
221	$1\frac{7}{16}" \times 1\frac{11}{16}"$	1.421" x 1.699"
222	$1\frac{1}{2}" \times 1\frac{3}{4}"$	1.484" x 1.762"
223	$1\frac{5}{8}" \times 1\frac{7}{8}"$	1.609" x 1.887"
224	$1\frac{3}{4}" \times 2"$	1.734" x 2.012"
225	$1\frac{7}{8}" \times 2\frac{1}{8}"$	1.859" x 2.137"
226	$2" \times 2\frac{1}{4}"$	1.984" x 2.262"
227	$2\frac{1}{8}" \times 2\frac{3}{8}"$	2.109" x 2.387"
228	$2\frac{1}{4}" \times 2\frac{1}{2}"$	2.234" x 2.512"
229	$2\frac{3}{8}" \times 2\frac{5}{8}"$	2.359" x 2.637"
230	$2\frac{1}{2}" \times 2\frac{3}{4}"$	2.484" x 2.762"
231	$2\frac{5}{8}" \times 2\frac{7}{8}"$	2.609" x 2.887"
232	$2\frac{3}{4}" \times 3"$	2.734" x 3.012"
233	$2\frac{7}{8}" \times 3\frac{1}{8}"$	2.859" x 3.137"
234	$3" \times 3\frac{1}{4}"$	2.984" x 3.262"
235	$3\frac{1}{8}" \times 3\frac{3}{8}"$	3.109" x 3.387"
236	$3\frac{1}{4}" \times 3\frac{1}{2}"$	3.234" x 3.512"



## O-Ring Sizing Chart (Cont.)

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: 1/8" Fractional (Cont.)		
237	3 3/8" x 3 5/8"	3.359" x 3.637"
238	3 1/2" x 3 3/4"	3.484" x 3.762"
239	3 5/8" x 3 7/8"	3.609" x 3.887"
240	3 3/4" x 4"	3.734" x 4.012"
241	3 7/8" x 4 1/8"	3.859" x 4.137"
242	4" x 4 1/4"	3.984" x 4.262"
243	4 1/8" x 4 3/8"	4.109" x 4.387"
244	4 1/4" x 4 1/2"	4.234" x 4.512"
245	4 3/8" x 4 5/8"	4.359" x 4.637"
246	4 1/2" x 4 3/4"	4.484" x 4.762"
247	4 5/8" x 4 7/8"	4.609" x 4.887"
248	4 3/4" x 5"	4.734" x 5.012"
249	4 7/8" x 5 1/8"	4.859" x 5.137"
250	5" x 5 1/4"	4.984" x 5.262"
251	5 1/8" x 5 3/8"	5.109" x 5.387"
252	5 1/4" x 5 1/2"	5.234" x 5.512"
253	5 3/8" x 5 5/8"	5.359" x 5.637"
254	5 1/2" x 5 3/4"	5.484" x 5.762"
255	5 5/8" x 5 7/8"	5.609" x 5.887"
256	5 3/4" x 6"	5.734" x 6.012"
257	5 7/8" x 6 1/8"	5.859" x 6.137"
258	6" x 6 1/4"	5.984" x 6.262"
259	6 1/4" x 6 1/2"	6.234" x 6.512"
260	6 1/2" x 6 3/4"	6.484" x 6.762"
261	6 3/4" x 7"	6.734" x 7.012"
262	7" x 7 1/4"	6.984" x 7.262"
263	7 1/4" x 7 1/2"	7.234" x 7.512"
264	7 1/2" x 7 3/4"	7.484" x 7.762"
265	7 3/4" x 8"	7.734" x 8.012"
266	8" x 8 1/4"	7.984" x 8.262"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: 1/8" Fractional (Cont.)		
267	8 1/4" x 8 1/2"	8.234" x 8.512"
268	8 1/2" x 8 3/4"	8.484" x 8.762"
269	8 3/4" x 9"	8.734" x 9.012"
270	9" x 9 1/4"	8.984" x 9.262"
271	9 1/4" x 9 1/2"	9.234" x 9.512"
272	9 1/2" x 9 3/4"	9.484" x 9.762"
273	9 3/4" x 10"	9.734" x 10.012"
274	10" x 10 1/4"	9.984" x 10.262"
275	10 1/2" x 10 3/4"	10.484" x 10.762"
276	11" x 11 1/4"	10.984" x 11.262"
277	11 1/2" x 11 3/4"	11.484" x 11.762"
278	12" x 12 1/4"	11.984" x 12.262"
279	13" x 13 1/4"	12.984" x 13.262"
280	14" x 14 1/4"	13.984" x 14.262"
281	15" x 15 1/4"	14.984" x 15.262"
282	16" x 16 1/4"	15.955" x 16.233"
283	17" x 17 1/4"	16.955" x 17.233"
284	18" x 18 1/4"	17.955" x 18.233"
Width: 3/16" Fractional (0.210" Actual)		
309	7/16" x 13/16"	0.412" x 0.832"
310	1/2" x 7/8"	0.475" x 0.895"
311	9/16" x 15/16"	0.537" x 0.957"
312	5/8" x 1"	0.600" x 1.020"
313	11/16" x 1 1/16"	0.662" x 1.082"
314	3/4" x 1 1/8"	0.725" x 1.145"
315	13/16" x 1 3/16"	0.787" x 1.207"
316	7/8" x 1 1/4"	0.850" x 1.270"
317	15/16" x 1 5/16"	0.912" x 1.332"
318	1" x 1 3/8"	0.975" x 1.395"
319	1 1/16" x 1 7/16"	1.037" x 1.457"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: 3/16" Fractional (Cont.)		
320	1 1/8" x 1 1/2"	1.100" x 1.520"
321	1 3/16" x 1 9/16"	1.162" x 1.582"
322	1 1/4" x 1 5/8"	1.225" x 1.645"
323	1 5/16" x 1 11/16"	1.287" x 1.707"
324	1 3/8" x 1 3/4"	1.350" x 1.770"
325	1 1/2" x 1 7/8"	1.475" x 1.895"
326	1 5/8" x 2"	1.600" x 2.020"
327	1 3/4" x 2 1/8"	1.725" x 2.145"
328	1 7/8" x 2 1/4"	1.850" x 2.270"
329	2" x 2 3/8"	1.975" x 2.395"
330	2 1/8" x 2 1/2"	2.100" x 2.520"
331	2 1/4" x 2 5/8"	2.225" x 2.645"
332	2 3/8" x 2 3/4"	2.350" x 2.770"
333	2 1/2" x 2 7/8"	2.475" x 2.895"
334	2 5/8" x 3"	2.600" x 3.020"
335	2 3/4" x 3 1/8"	2.725" x 3.145"
336	2 7/8" x 3 1/4"	2.850" x 3.270"
337	3" x 3 3/8"	2.975" x 3.395"
338	3 1/8" x 3 1/2"	3.100" x 3.520"
339	3 1/4" x 3 5/8"	3.225" x 3.645"
340	3 3/8" x 3 3/4"	3.350" x 3.770"
341	3 1/2" x 3 7/8"	3.475" x 3.895"
342	3 5/8" x 4"	3.600" x 4.020"
343	3 3/4" x 4 1/8"	3.725" x 4.145"
344	3 7/8" x 4 1/4"	3.850" x 4.270"
345	4" x 4 3/8"	3.975" x 4.395"
346	4 1/8" x 4 1/2"	4.100" x 4.520"
347	4 1/4" x 4 5/8"	4.225" x 4.645"
348	4 3/8" x 4 3/4"	4.350" x 4.770"
349	4 1/2" x 4 7/8"	4.475" x 4.895"

## O-Ring Sizing Chart (Cont.)

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{3}{16}$ " Fractional (Cont.)		
350	$4\frac{7}{8}" \times 5"$	4.600" x 5.020"
351	$4\frac{3}{4}" \times 5\frac{1}{8}"$	4.725" x 5.145"
352	$4\frac{7}{8}" \times 5\frac{1}{4}"$	4.850" x 5.270"
353	$5" \times 5\frac{3}{8}"$	4.975" x 5.395"
354	$5\frac{1}{8}" \times 5\frac{1}{2}"$	5.100" x 5.520"
355	$5\frac{1}{4}" \times 5\frac{5}{8}"$	5.225" x 5.645"
356	$5\frac{3}{8}" \times 5\frac{3}{4}"$	5.350" x 5.770"
357	$5\frac{1}{2}" \times 5\frac{7}{8}"$	5.475" x 5.895"
358	$5\frac{5}{8}" \times 6"$	5.600" x 6.020"
359	$5\frac{3}{4}" \times 6\frac{1}{8}"$	5.725" x 6.145"
360	$5\frac{7}{8}" \times 6\frac{1}{4}"$	5.850" x 6.270"
361	$6" \times 6\frac{3}{8}"$	5.975" x 6.395"
362	$6\frac{1}{4}" \times 6\frac{5}{8}"$	6.225" x 6.645"
363	$6\frac{1}{2}" \times 6\frac{7}{8}"$	6.475" x 6.895"
364	$6\frac{3}{4}" \times 7\frac{1}{8}"$	6.725" x 7.145"
365	$7" \times 7\frac{3}{8}"$	6.975" x 7.395"
366	$7\frac{1}{4}" \times 7\frac{5}{8}"$	7.225" x 7.645"
367	$7\frac{1}{2}" \times 7\frac{7}{8}"$	7.475" x 7.895"
368	$7\frac{3}{4}" \times 8\frac{1}{8}"$	7.725" x 8.145"
369	$8" \times 8\frac{3}{8}"$	7.975" x 8.395"
370	$8\frac{1}{4}" \times 8\frac{5}{8}"$	8.225" x 8.645"
371	$8\frac{1}{2}" \times 8\frac{7}{8}"$	8.475" x 8.895"
372	$8\frac{3}{4}" \times 9\frac{1}{8}"$	8.725" x 9.145"
373	$9" \times 9\frac{3}{8}"$	8.975" x 9.395"
374	$9\frac{1}{4}" \times 9\frac{5}{8}"$	9.225" x 9.645"
375	$9\frac{1}{2}" \times 9\frac{7}{8}"$	9.475" x 9.895"
376	$9\frac{3}{4}" \times 10\frac{1}{8}"$	9.725" x 10.145"
377	$10" \times 10\frac{3}{8}"$	9.975" x 10.395"
378	$10\frac{1}{2}" \times 10\frac{7}{8}"$	10.475" x 10.895"
379	$11" \times 11\frac{3}{8}"$	10.975" x 11.395"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{1}{16}$ " Fractional (Cont.)		
380	$11\frac{1}{2}" \times 11\frac{7}{8}"$	11.475" x 11.895"
381	$12" \times 12\frac{3}{8}"$	11.975" x 12.395"
382	$13" \times 13\frac{3}{8}"$	12.975" x 13.395"
383	$14" \times 14\frac{3}{8}"$	13.975" x 14.395"
384	$15" \times 15\frac{3}{8}"$	14.975" x 15.395"
385	$16" \times 16\frac{3}{8}"$	15.975" x 16.395"
386	$17" \times 17\frac{3}{8}"$	16.975" x 17.395"
387	$18" \times 18\frac{3}{8}"$	17.975" x 18.395"
388	$19" \times 19\frac{3}{8}"$	18.975" x 19.395"
389	$20" \times 20\frac{3}{8}"$	19.975" x 20.395"
390	$21" \times 21\frac{3}{8}"$	20.975" x 21.395"
391	$22" \times 22\frac{3}{8}"$	21.975" x 22.395"
392	$23" \times 23\frac{3}{8}"$	22.975" x 23.395"
393	$24" \times 24\frac{3}{8}"$	23.975" x 24.395"
394	$25" \times 25\frac{3}{8}"$	24.975" x 25.395"
395	$26" \times 26\frac{3}{8}"$	25.975" x 26.395"
Width: $\frac{1}{4}$ " Fractional (0.275" Actual)		
404	$1\frac{7}{8}" \times 2\frac{3}{8}"$	1.850" x 2.400"
405	$2" \times 2\frac{1}{2}"$	1.975" x 2.525"
406	$2\frac{1}{8}" \times 2\frac{5}{8}"$	2.100" x 2.650"
407	$2\frac{1}{4}" \times 2\frac{3}{4}"$	2.225" x 2.775"
408	$2\frac{3}{8}" \times 2\frac{7}{8}"$	2.350" x 2.900"
409	$2\frac{1}{2}" \times 3"$	2.475" x 3.025"
410	$2\frac{5}{8}" \times 3\frac{1}{8}"$	2.600" x 3.150"
411	$2\frac{3}{4}" \times 3\frac{1}{4}"$	2.725" x 3.275"
412	$2\frac{7}{8}" \times 3\frac{3}{8}"$	2.850" x 3.400"
413	$3" \times 3\frac{1}{2}"$	2.975" x 3.525"
414	$3\frac{1}{8}" \times 3\frac{5}{8}"$	3.100" x 3.650"
415	$3\frac{1}{4}" \times 3\frac{3}{4}"$	3.225" x 3.775"
416	$3\frac{3}{8}" \times 3\frac{7}{8}"$	3.350" x 3.900"

AS568A Dash No.	Fractional Size, ID x OD	Actual Size, ID x OD
Width: $\frac{1}{4}$ " Fractional (Cont.)		
417	$3\frac{1}{2}" \times 4"$	3.475" x 4.025"
418	$3\frac{5}{8}" \times 4\frac{1}{8}"$	3.600" x 4.150"
419	$3\frac{3}{4}" \times 4\frac{1}{4}"$	3.725" x 4.275"
420	$3\frac{7}{8}" \times 4\frac{3}{8}"$	3.850" x 4.400"
421	$4" \times 4\frac{1}{2}"$	3.975" x 4.525"
422	$4\frac{1}{8}" \times 4\frac{5}{8}"$	4.100" x 4.650"
423	$4\frac{1}{4}" \times 4\frac{3}{4}"$	4.225" x 4.775"
424	$4\frac{3}{8}" \times 4\frac{7}{8}"$	4.350" x 4.900"
425	$4\frac{1}{2}" \times 5"$	4.475" x 5.025"
426	$4\frac{5}{8}" \times 5\frac{1}{8}"$	4.600" x 5.150"
427	$4\frac{3}{4}" \times 5\frac{1}{4}"$	4.725" x 5.275"
428	$4\frac{7}{8}" \times 5\frac{3}{8}"$	4.850" x 5.400"
429	$5" \times 5\frac{1}{2}"$	4.975" x 5.525"
430	$5\frac{1}{8}" \times 5\frac{5}{8}"$	5.100" x 5.650"
431	$5\frac{1}{4}" \times 5\frac{3}{4}"$	5.225" x 5.775"
432	$5\frac{3}{8}" \times 5\frac{7}{8}"$	5.350" x 5.900"
433	$5\frac{1}{2}" \times 6"$	5.475" x 6.025"
434	$5\frac{5}{8}" \times 6\frac{1}{8}"$	5.600" x 6.150"
435	$5\frac{3}{4}" \times 6\frac{1}{4}"$	5.725" x 6.275"
436	$5\frac{7}{8}" \times 6\frac{3}{8}"$	5.850" x 6.400"
437	$6" \times 6\frac{1}{2}"$	5.975" x 6.525"
438	$6\frac{1}{4}" \times 6\frac{3}{4}"$	6.225" x 6.775"
439	$6\frac{1}{2}" \times 7"$	6.475" x 7.025"
440	$6\frac{3}{4}" \times 7\frac{1}{4}"$	6.725" x 7.275"
441	$7" \times 7\frac{1}{2}"$	6.975" x 7.525"
442	$7\frac{1}{4}" \times 7\frac{3}{4}"$	7.225" x 7.775"
443	$7\frac{1}{2}" \times 8"$	7.475" x 8.025"
444	$7\frac{3}{4}" \times 8\frac{1}{4}"$	7.725" x 8.275"
445	$8" \times 8\frac{1}{2}"$	7.975" x 8.525"
446	$8\frac{1}{2}" \times 9"$	8.475" x 9.025"

## O-Ring Sizing Chart (Cont.)

AS568A Dash No.	Fractional Size, ID × OD	Actual Size, ID × OD
<b>Width: 1/4" Fractional (Cont.)</b>		
447	9" × 9 1/2"	8.975" × 9.525"
448	9 1/2" × 10"	9.475" × 10.025"
449	10" × 10 1/2"	9.975" × 10.525"
450	10 1/2" × 11"	10.475" × 11.025"
451	11" × 11 1/2"	10.975" × 11.525"
452	11 1/2" × 12"	11.475" × 12.025"
453	12" × 12 1/2"	11.975" × 12.525"
454	12 1/2" × 13"	12.475" × 13.025"
455	13" × 13 1/2"	12.975" × 13.525"
456	13 1/2" × 14"	13.475" × 14.025"
457	14" × 14 1/2"	13.975" × 14.525"
458	14 1/2" × 15"	14.475" × 15.025"
459	15" × 15 1/2"	14.975" × 15.525"
460	15 1/2" × 16"	15.475" × 16.025"
461	16" × 16 1/2"	15.955" × 16.505"
462	16 1/2" × 17"	16.455" × 17.005"
463	17" × 17 1/2"	16.955" × 17.505"
464	17 1/2" × 18"	17.455" × 18.005"
465	18" × 18 1/2"	17.955" × 18.505"
466	18 1/2" × 19"	18.455" × 19.005"
467	19" × 19 1/2"	18.955" × 19.505"
468	19 1/2" × 20"	19.455" × 20.005"
469	20" × 20 1/2"	19.955" × 20.505"
470	21" × 21 1/2"	20.955" × 21.505"
471	22" × 22 1/2"	21.955" × 22.505"
472	23" × 23 1/2"	22.940" × 23.490"
473	24" × 24 1/2"	23.940" × 24.490"
474	25" × 25 1/2"	24.940" × 25.490"
475	26" × 26 1/2"	25.940" × 26.490"

AS568A Dash No.	Tube Size OD, Inches	Actual Inch Size, ID × OD
<b>For Boss Tube Fittings</b>		
<b>0.056" Wide</b>		
901	3/32"	0.185" × 0.297"
<b>0.064" Wide</b>		
902	1/8"	0.239" × 0.367"
903	3/16"	0.301" × 0.429"
<b>0.072" Wide</b>		
904	1/4"	0.351" × 0.495"
905	5/16"	0.414" × 0.558"
<b>0.078" Wide</b>		
906	3/8"	0.468" × 0.624"
<b>0.082" Wide</b>		
907	7/16"	0.530" × 0.694"
<b>0.087" Wide</b>		
908	1/2"	0.644" × 0.818"
<b>0.097" Wide</b>		
909	9/16"	0.706" × 0.900"
910	5/8"	0.755" × 0.949"
<b>0.116" Wide</b>		
911	1 1/16"	0.863" × 1.095"
912	3/4"	0.924" × 1.156"
913	13/16"	0.986" × 1.218"
914	7/8"	1.047" × 1.279"
916	1"	1.171" × 1.403"
918	1 1/8"	1.355" × 1.587"
<b>0.118" Wide</b>		
920	1 1/4"	1.475" × 1.711"
924	1 1/2"	1.720" × 1.956"
928	1 3/4"	2.090" × 2.326"
932	2"	2.337" × 2.573"



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## Item Details

Pneumatics &amp; Hydraulics &gt; System Components &gt; Oil Removal Filters

## Filter, Coalescing

Oil Removal Coalescing Filter, NPT 1/2 Inch, Bowl Size 6.11 Ounces, Bowl Material Polycarbonate, Air Flow 28 CFM, Maximum Pressure 150 PSI, Maximum Temperature 125 Degrees Fahrenheit, Height 9.30 Inches, Width 2.90 Inches, 0.5 Micron, Standard 28 Series, Modular Design, With Bowl Guard

Grainger Item: 6B259

Price (ea): \$75.10

Manufacturer: WILKERSON

Mfg. Model#: M28-04-BK00

Ship Qty : 1

Sell Qty (Will-Call) : 1

Usually Ships : Today

Catalog 396 Page: 1459



Qty.

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Compare Attributes

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## NOTES &amp; RESTRICTIONS



Repair Parts Info available for this product.

See Catalog 396 Page for application and/or safety information.

## OPTIONAL ACCESSORIES

## Filter Element, Oil

Coalescing Oil Filter Element, Rating 0.5 Micron, For Use On Standard Filter 6B258, 6B259, 6B260, 6D809, 6D809, 6D810, 6D811

Price (ea): \$19.80

Grainger Item#: 6B231

Usually Ships : Today



Qty.

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Add to Order

## End Block, 1/2 In NPT

End Block, NPT 1/2 Inch, NPT Outlet 1/2 Inch

Price (ea): \$9.53

Grainger Item#: 6B236

Usually Ships : Today



Qty.

Add to Personal List

Add to Order

## TECHNICAL SPEC

Type	Standard Model
Item	Oil Removal Filter
NPT (In.)	1/2
Max. Temp. (F)	125
Bowl Size (Oz.)	6.11
Bowl Type (Material)	Polycarbonate
Height (In.)	9.30
Width (In.)	2.90
CFM	28
Adjustment Range (PSI)	0-12
Adjustment Knob	Non-Adjustable
Includes	Bowl Indicator

**Bracket,C Mounting**

C Mounting Bracket, Wall Mount for F28, L28, M28 Series  
Lube/Filter

Price (ea): \$8.78  
Grainger Item#: 6B243

Usually Ships  : Today



Qty.


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**Bracket,Wall Mount**

Modular Wall Mount Bracket, For Compact and Standard  
Filter/Lubricators

Price (ea): \$10.28  
Grainger Item#: 6B245

Usually Ships  : Today



Qty.

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**Connector,Modular**

Modular Connector, For Compact and Standard Wall Mount  
Bracket 6B246

Price (ea): \$7.35  
Grainger Item#: 6B247

Usually Ships  : Today



Qty.

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**ALTERNATE PRODUCTS****Filter,Coalescing**

Oil Removal Coalescing Filter, NPT 3/4 Inch, Bowl Size 6.11  
Ounces, Bowl Material Polycarbonate, Air Flow 30 CFM,  
Maximum Pressure 150 PSI, Maximum Temperature

Price (ea): \$75.10  
Grainger Item#: 6B258

Usually Ships  : Today



Qty.

[Add to Personal List](#)

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**Filter,Coalescing**

Oil Removal Coalescing Filter, NPT 1/2 Inch, Bowl Size 6.11  
Ounces, Bowl Material Metal, Air Flow 28 CFM, Maximum  
Pressure 250 PSI, Maximum Temperature

Price (ea): \$81.15

Usually Ships  : Today

Grainger Item#: 6D810

Qty. [Add to Personal List](#)[Add to Order](#)[Compare Alternates](#)**Filter,Oil Removal**

Coalescing Standard Oil Removal Filter, NPT 1/2 Inch, Bowl  
Size 7.0 Ounces, Bowl Material Polycarbonate, Maximum  
Pressure 150 PSI, Maximum Flow 35 CFM,

Price (ea): \$102.35

Usually Ships ☐ : Today

Grainger Item#: 4ZL46

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<b>Duramax Shed Matrix</b>										
Shed Size	Outer Dimensions			Inner Dimensions			Door Dimensions		Size	
	Width	Depth	Height	Width	Depth	Wall Height	Door Width	Door Height	Square Feet	Weight (lbs.)
<b>8'x4' Sidemate</b>	94.2"	47.6"	63.38" (Front) 72.0" (Back)	92.4"	45.7"	63.38"	30.19"	61.8"	31.0	170
<b>8'x6' Duramate</b>	94.21"	63.11"	73.03"	92.4"	61.3"	63.4"	61.61"	62.08"	39.3	190
<b>8'x8' Duramate</b>	94.21"	94.21"	73.03"	92.4"	92.4"	63.4"	61.61"	62.08"	59.3	247
<b>10'x8' Woodbridge</b>	125.31"	94.21"	86.43"	123.5"	92.4"	73.0"	61.61"	71.73"	79.23	326
<b>10'x10' Woodbridge</b>	125.31"	125.31"	86.43"	123.5"	123.5"	73.0"	61.61"	71.73"	105.9	410
<b>10'x13' Woodbridge</b>	125.31"	156.4"	86.43"	123.5"	154.6"	73.0"	61.61"	71.73"	132.5	494
<b>5'x3' Yardsaver</b>	63.1"	32"	77.95"	61.3"	30.1"	73.0"	52.8"	71.73"	14.43	140
<b>5'x5' Yardsaver</b>	63.1"	63.1"	77.95"	61.3"	61.3"	73.0"	52.8"	71.73"	27.56	160
<b>5'x8' Yardsaver</b>	63.1"	94.2"	77.95"	61.3"	92.4"	73.0"	52.8"	71.73"	40.68	180

- All Weather Durable PVC
- Available in Various Sizes
- Fire Retardant
- Built to Last
- Rust and Rot Proof
- Maintenance Free
- Wide Durable Doors
- Quick and Easy Assembly
- Never Needs Painting
- Wind tested for up to 115 Mph
- High Head Room for Garden Implements
- Economically the best value for the money

*DURAMAX* is the highest quality, value priced vinyl sheds in the market today. Intelligently designed, DuraMax offers the advantages of vinyl eliminating rotting wood or rusting metal.

DuraMax outperforms all others products in the market, with its superior strength, quick assembly time, maintenance free advantages of vinyl as well as wide double doors.

The support beams incorporated in the design can support shelving and window kits, which are also available. With its contemporary design and neutral color, DuraMax is more than just a storage shed, its an ideal activity or storage room.

#### **DuraMax Storage Shed - Limited Fifteen Year Warranty**

U.S. Polymers Inc. will send a replacement part free of charge, in the event of material defects and or workmanship for a period of Fifteen years from the date of purchase.

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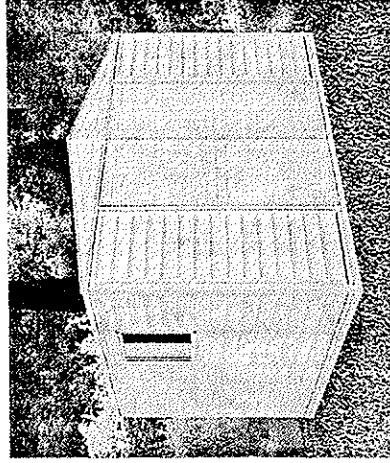
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# DURAMAX

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- [Specifications](#)
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- All Weather Durable PVC
- Available in Various Sizes
- Fire Retardant
- Built to Last
- Rust and Rot Proof
- Maintenance Free

- Wide Durable Doors
- Quick and Easy Assembly
- Never Needs Painting
- Wind tested for up to 115 Mph
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**DuraMax Storage Shed  
Limited Fifteen Year Warranty**

U.S. Polymers Inc. will send a replacement part free of charge, in the event of material defects and or workmanship for a period of Fifteen years from the date of purchase.

This warranty is extended only to the original purchaser. A purchase receipt or other proof of date of original purchase will be required before warranty service is rendered. In no event shall we pay the cost of flooring, labor installation or any other costs related thereto.

This warranty only covers failures due to defects in material or workmanship which occurs during normal use and does not extend to color change arising due to normal weathering or to damage resulting from misuse or neglect, commercial use, failure to follow assembly instructions and the owner's manual (including proper anchoring of the shed), painting, forces of nature and other causes which is beyond our control.

Claims under this warranty must be made within the warranty period by calling 1-800-483-4674 or mail in a date sales slip and clear photograph of the part to:

U.S. Polymers Inc.  
6915 Stlauson Avenue  
Commerce, CA. 90040

We reserve the right to discontinue or change components. If a component has been discontinued or is not available, U.S. Polymers Inc. reserves the right to substitute a component of equal quality as may be compatible.

**Limited and Exclusions.**

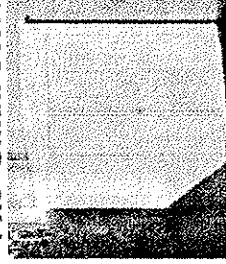
There are no express warranties except as listed above. The warrantor shall not be liable for incidental or consequential damages resulting from the use of this product, or arising out of any breach of this warranty. All express warranties are limited to the warranty period set forth above. Some states do not allow exclusion or limitation on how long an implied warranty lasts, so the above limitations may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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Specifications

DuraMax Specifications

4'x8' Small Storage Shed



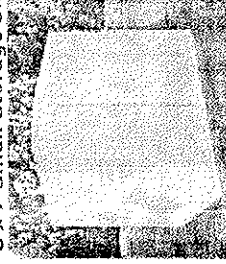
Sku Number:	Cubic Feet:	Door Open:	Interior Height:
00611	154	62"H x 30"W	63"

Interior Width:	Interior Depth:	Shipping Weight:
46"	92"	170lbs

Description:

DURAMAX is more than just a storage shed, the refined design and size of this sheds makes it perfect for a storage or tool room. Our storage sheds offer a contemporary design in neutral colors that will naturally blend in with any backyard or garden. This 4? x 8? shed fits perfectly on the side of your house and is easily accessible.

8'x8' Small Storage Shed



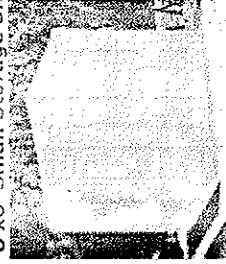
Sku Number:	Cubic Feet:	Door Open:	Interior Height:
00111	207	62"H x 61"W	63"

Interior Width:	Interior Depth:	Shipping Weight:
92"	61"	190lbs

Description:

DURAMAX is more than just a storage shed, the refined design of our sheds makes it perfect for an activity or hobby room. Our storage sheds offer a contemporary design in neutral colors that will naturally blend in with any backyard or garden and is spacious enough to store lawn and garden implements.

8'x8' Small Storage Shed



Sku Number:	Cubic Feet:	Door Open:	Interior Height:
00311	313	62"H x 61"W	63"

Interior Width:	Interior Depth:	Shipping Weight:
92"	92"	247lbs

Description:

DURAMAX is more than just a storage shed, the refined design of our sheds makes it perfect for an activity or hobby room. Our storage sheds offer a contemporary design in neutral colors that will naturally blend in with any backyard or garden.

10'x8' Large Storage Shed

Sku	Cubic	Door	Interior
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**DuraMax Where to Buy**

We sell our products through a network of dealers and mass merchants around the country. For more information on how to buy a DuraMax storage shed, Please check our list of dealers or call us at 800-483-4674.

Thank you.

State	City	Name	web site
AZ	Yuma	Westerner Products of Yuma	
CA	Canoga Park	Sheds Direct	www.fadirect.com
CA	Downey	All American	
CA	San Diego	Dixieline	www.dixieline.com
CA	Escondido	Dixieline	www.dixieline.com
CA	El Cajon	Dixieline	www.dixieline.com
CA	Solana Beach	Dixieline	www.dixieline.com
CA	National City	Dixieline	www.dixieline.com
CA	La Mesa	Dixieline	www.dixieline.com
CA	Poway	Dixieline	www.dixieline.com
CA	Santa Rosa	Friedman Bros Home Improvement	
CA	Petaluma	Friedman Bros Home Improvement	
CA	Ukiah	Friedman Bros Home Improvement	
CA	El Centro	Imperial Hardware	
CA	Regional Westcoast	Orchards Supply Hardware	www.osh.com
CO	Springfield	Gambles Do It Best	www.dob.com
FL	St Petersburg	So Florida Vertical West	
GA	Blue Ridge	Appalachian Trailers	
HI	Kailua Kona	HPM	
HI	Kalaupapa	HPM	
HI	Kaneohe	HPM	
HI	Honolulu	City Mill	
IA	Oskaloosa	Malcolm Lumber	
IA	Grinnel	Malcolm Lumber	
IL	Lanark	Carrolls Service Store	
IL	Fairfield	Southern Illinois Lumber Co	
KS	Council Grove	Adams Lumber Store	
KY	Glasgow	Lessenberry Building Center	
MI	Ontonagon	Hawley Lumber	
MI	Jackson	Hammond Hardware	
MI	Sault Sainte Marie	Lock City Home Center	
MN	Watertown	Fullerton Lumber	

MO	Marshall	La Crosse Lumber Co	
National	Sears Catalog		<a href="#">www.se</a>
National	Costco E Commerce		<a href="#">www.cc</a>
National	Sears		<a href="#">www.se</a>
National	Kmart		<a href="#">www.km</a>
Regional	Menards	Midwest	<a href="#">www.m</a>
ND	Grand Forks	Home of Economy	
NE	Gothenburg	Hicken Lumber & Home Center	
NE	McCook	Barnetts	
NM	Bosque Farms	Hacienda Bosque Farms	
NM	Espanola	Hacienda Bosque Farms	
NM	Albuquerque	Hacienda Home Center	
NY	Potsdam	Bicknell Building Supply	
NY	Lakeville	Smith Lumber & Hardware	
OH	Bowling Green	Bee Gee Lumber	
OH	Akron	Swan Hardware	
SD	Brookings	Homestead Do It Center	
Internet		Durasheds	<a href="#">www.du</a>
Internet		Patio Concept	<a href="#">www.pa</a>
Internet		Shed City USA	<a href="#">www.sh</a>
Internet		Screenhouses unlimited	<a href="#">www.pa</a>
Internet		ShedTopia	<a href="#">www.sh</a>
Internet		Betty Mills	<a href="#">www.Be</a>

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Power Attic

WARRANTY

CertainTeed Mfg. offers a 10-year warranty for Nos. 4YN76 and 4YN77. Text of warranty available on request. See "Manufacturers' Warranties" on page opposite inside back cover.



Stock No.	List	Each	Shpg. Wt.
4YN78	\$67.17	\$41.66	12.0
4YN76	104.56	64.84	12.0
4YN77	123.92	76.85	12.0

WARRANTY

CertainTeed Mfg. offers a 10-year warranty for No. 4C671. Text of warranty available on request. See "Manufacturers' Warranties" on page opposite inside back cover.



List	Each	Shpg. Wt.
\$71.80	\$47.04	15.0
83.50	51.13	12.0
100.20	59.62	19.0
150.30	90.98	24.0

WARRANTY

CertainTeed Mfg. offers a 10-year warranty for No. 4CH65. Text of warranty available on request. See "Manufacturers' Warranties" on page opposite inside back cover.

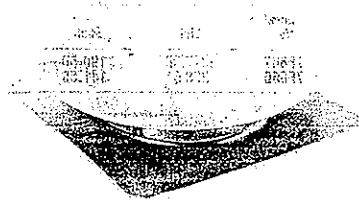


List	Each	Shpg. Wt.
\$187.55	\$110.49	26.0

fast easy no minimums See pages A2-A12 for details.



TESTED/CERTIFIED



No. 5C041

BROAN ROOF-MOUNTED ATTIC VENTILATORS

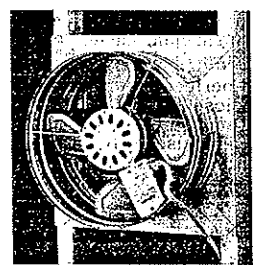
Roof-mounted ventilator with adjustable built-in thermostat operates automatically between 70° to 130°F circulating the air to help cool attic and reduce air conditioner strain. Unit has mesh screen to keep away birds and insects and easily mounts between rafters. Features include automatic reset, thermally protected and permanently lubricated motor to prevent overheating, precision-balanced 14" metal blade, 3/4" high splash guard to keep out rain, and heavy gauge metal flashing. Thermostat and motor are accessible from outside for easy servicing. Durable off-white, fade resistant PVC dome can be painted to match roof color. Broan brand.

- UL Listed (E17814)
- HVI Certified

CFM @ 0.3" SP	"Free Air" Intake Req'd	Maximum Attic Area	Fan RPM	Amps	HP	Volts 60 Hz	Broan Model	Stock No.	List	Each	Shpg. Wt.
1050	3.50 sq. ft.	1500 sq. ft.	1080	3.6	1/15	120	350	5C041	\$115.32	\$56.41	15.0
1200	4.00 sq. ft.	1715 sq. ft.	1100	4.3	1/10	120	355	4C568	126.54	63.65	17.0
1600	5.33 sq. ft.	2285 sq. ft.	1500	8.0	1/5	120	356	5C042	173.69	89.11	22.0



TESTED/CERTIFIED



No. 4C671

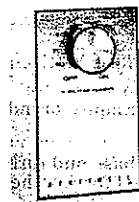
BROAN GABLE-MOUNTED ATTIC VENTILATOR

Gable-mounted ventilator with built-in adjustable thermostat operates automatically between 70° to 130°F circulating the air to help cool attic and reduce air conditioner strain. Features include thermally protected and permanently lubricated motor, precision-balanced 14" metal blade for maximum airflow, and heavy gauge galvanized steel housing with ribs for added strength. Mounting brackets included. Motor can be serviced from the attic. 15" diameter x 8" deep. Broan brand.

- UL Listed (E17814)
- HVI Certified

Description	CFM @ 0.3" SP	Shutter Type	"Free Air" Intake Req'd (Sq. Ft.)	Max. Attic Area (Sq. Ft.)	RPM	Amps	Volts 60 Hz	Broan Model	Stock No.	List	Each	Shpg. Wt.
Gable Mount w/Auto Shutter	1140	Auto	4.0	1630	950	3.4	120	353	4C671	\$103.41	\$51.65	12.0
Gable Mount w/Wood Shutter	900	Wood	3.0									
Gable Vent	1600	—	5.3	2285	1500	6.0	120	35316	5ZR16	157.90	82.90	13.0

Honeywell



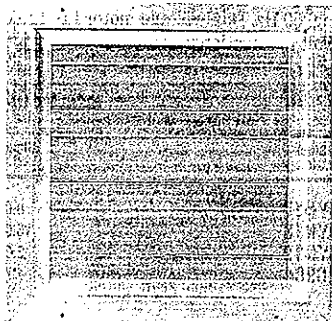
No. 2E574

HUMIDITY CONTROL FOR ATTIC VENTILATORS

Provides automatic control of attic ventilator to prevent humidity from exceeding selected relative humidity level. Range adjusts from 20-80% with 4-6% differential. External control has nylon element and snap action micro-switch rated 7.5 full-load amps @ 115V, 60 Hz.

Bronze plastic cover and metal adapter plate for vertical switch box mounting. Wiring diagram included. 4 1/8" H x 2 1/8" W x 1 1/8" D. UL Listed. CSA Certified. Honeywell brand (H46C100).

No. 2E574. Shpg. wt. 1.0 lbs. List \$104.59 Each \$55.50

**Dayton**

No. 4HX74 Wall Damper

**Backdraft Dampers**

For direct or belt-drive centrifugal roof and wall ventilators. Roof mount units have 19 gauge galvanized steel frame, 2" deep with 1" flange. Aluminum blades have felted edges for quiet operation. Prepunched conduit hole knock-out. Wall mount units have 16 gauge

extruded aluminum frame, 1½" deep with 1½" flange. Wall mount blades are aluminum with felted edges.

**WARNING! NOT FOR USE WITH ANY KITCHEN EXHAUST APPLICATION.**

Damper Size (In.)	Outside Flange (In.)	For Use With Dayton Ventilators (UL 705 Only)	Stock No.	List	Each	Ship. Wt.
<b>ROOF MOUNT BACKDRAFT DAMPERS</b>						
9½ x 9½	11½ x 11½	2C912, 4WN57	3TZ50	\$32.50	\$20.13	2.5
12 x 12	14 x 14	4HX80, 4XH91, 4HZ18, 4HZ19, 4HZ20, 4HZ21, 4HZ32, 4HZ36, 4HZ37	4HX64	29.92	18.55	4.5
15 x 15	17 x 17	4XH81, 4HX82, 4HX92, 4HX93, 4HX22, 4HX23, 4HZ24, 4HZ25, 4HZ40, 4HZ41, 4HZ44, 4HZ45	4HX65	36.75	22.77	6.0
19 x 19	21 x 21	4HX83, 4HX84, 4HX94, 4HX95, 4HX26, 4HZ27, 4HZ28, 4HZ29, 4HZ48, 4HZ49, 4HZ52, 4HZ53	4HX66	43.55	27.01	7.5
23 x 23	25 x 25	4HX85, 4HX86, 4HX96, 4HX97, 4HZ30, 4HZ31, 4HZ56, 4HZ57	4HX67	56.23	34.88	9.0
27 x 27	29 x 29	4HX87, 4HX98	4HX68	65.74	40.78	13.0
35 x 35	37 x 37	4HX88, 4HX99	4HX69	92.71	57.49	20.0
39 x 39	41 x 41	4HX89, 4HZ01	4HX70	120.09	74.47	26.0
50 x 50	52 x 52	4HX90	4HX71	158.11	98.01	34.0
<b>WALL MOUNT BACKDRAFT DAMPERS</b>						
8 x 8	10¼ x 10¼	4HZ34, 4HZ35	4HX72	25.57	15.85	4.5
10 x 10	12¼ x 12¼	4HZ38, 4HZ39	4HX73	36.88	22.85	5.0
11 x 11	13¼ x 13¼	4HZ42, 4HZ43	4HX33	40.46	25.08	6.0
12 x 12	14¼ x 14¼	4HZ46, 4HZ47	4HX74	44.49	27.58	6.5
13 x 13	15¼ x 15¼	4HZ50, 4HZ51	4HX75	48.34	29.96	7.0
14 x 14	16¼ x 16¼	4HZ54, 4HZ55	4HX76	50.89	31.57	7.5
15 x 15	17¼ x 17¼	4HZ58, 4HZ59	4HX77	56.23	34.88	8.0

X -



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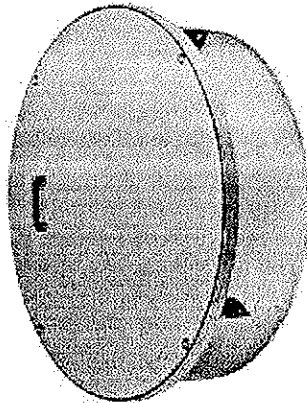
OPW > OPW Environmental > Underground Storage Tank Equipment > Manholes & Monitoring Well Equipment > Steel Manholes

Pomeco/OPW 110/120  
Series Steel Round  
Manholes (6110-0800  
6110-08WT 6110-12WT  
6110-1200 6110-16WT  
6110-1600 6110-18WT  
6110-1800 6110-24WT  
6110-2410 6110-30WT  
6110-3010 6110-37WT  
6110-3710 6110-37TX  
6110-4010 6110-42WT  
6110-4200 6110-48WT  
6120-18WT 6120-12WT  
6120-24WT 6120-30WT  
6120-37WT 6120-42WT  
6120-48WT)

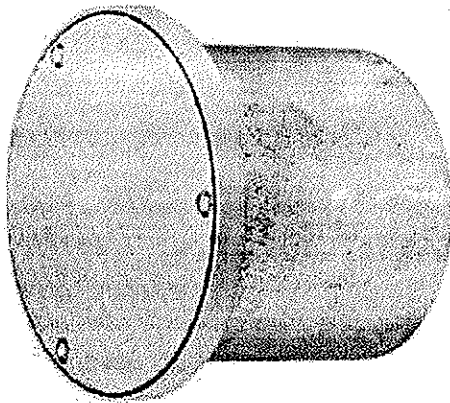
Ordering Specifications

Model No.	Description	O.D.	I.D.	Thickness	Weight	Ring
6110-0800	Standard	9 7/8"	25 8"	20 3/8"	12 5	Cast Iron
6110-08WT	Raintight	9 7/8"	25 8"	20 3/8"	12 5	Cast Iron
6110-12WT	Raintight	14 1/2"	35 12"	30 3/8"	30 14	Fab. Steel
6110-1200	Standard	14 1/2"	35 12"	30 3/8"	30 14	Fab. Steel
6110-6110	Raintight	18"	46 16"	41 3/8"	9 45 20	Fab.

POMECO/OPW 110/120 Series Round Manholes are designed for use in a wide range of service station driveway, industrial, and commercial applications. The 110s and 120s are used to provide access to all types of underground equipment, including vapor recovery connections, UST monitoring equipment and submersible pumps. The 120 Series includes Roto-Lock fasteners on 24" and larger manholes.



[view more detailed image »](#)



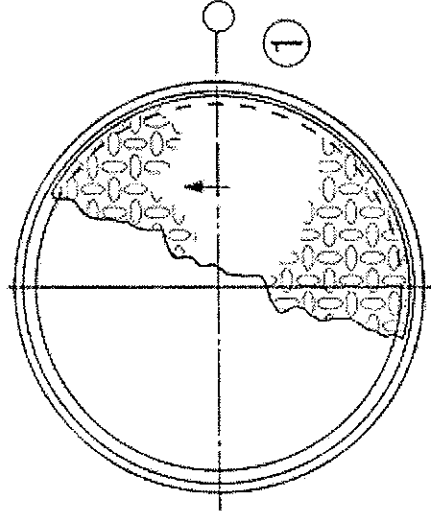
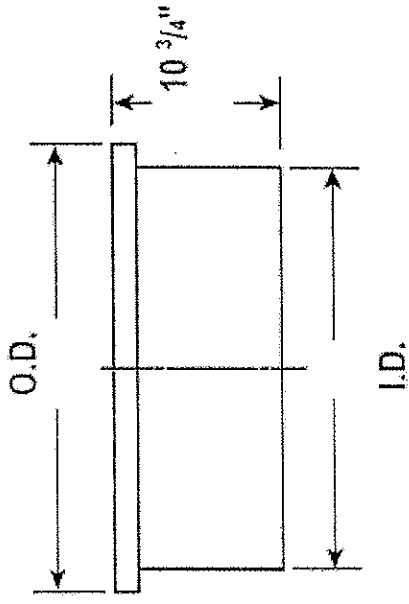
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16WT	Standard	18"	46	16"	41	3/8"	9	45	20	Steel
6110-1600	Raintight	20 1/8"	51	18"	46	3/8"	9	54	25	Fab. Steel
6110-18WT	Standard	20 1/8"	51	18"	46	3/8"	9	54	25	Fab. Steel
6110-1800	Raintight*	24"	61	21 5/8"	55	3/8"	9	88	40	Fab. Steel
6110-24WT	Standard*	24"	61	22 3/4"	58	3/8"	9	88	40	Fab. Steel
6110-2410	Raintight*	30"	76	27 5/8"	70	1/2"	13	160	73	Fab. Steel
6110-30WT	Standard*	30"	76	27 5/8"	70	3/8"	9	160	73	Fab. Steel
6110-3010	Raintight*	37"	94	34 5/8"	88	1/2"	13	178	81	Fab. Steel
6110-37WT	Standard*	37"	94	34 5/8"	88	3/8"***	9	178	81	Fab. Steel
6110-3710	Raintight*	37"	94	34 5/8"	88	3/8"***	9	178	81	Fab. Steel
6110-37TX	Standard*	40"	102	37 5/8"	96	3/8"	9	198	90	Fab. Steel
6110-4010	Raintight*	42"	107	39 5/8"	101	1/2"***	13	290	132	Fab. Steel
6110-42WT	Standard	42"	107	39 5/8"	101	1/2"***	13	290	132	Fab. Steel
6110-4200	Raintight*	48"	122	45 5/8"	116	3/4"	19	390	177	Fab. Steel
6110-48WT	Raintight	20 1/8"	51	18"	46	3/8"	9	54	25	Fab. Steel
6120-18WT	Raintight	13 3/4"	35	12"	30	3/8"	9	30	14	Fab. Steel
6120-12WT	Roto-Lock Raintight 24WT*	24"	61	21 5/8"	55	3/8"	9	88	40	Fab. Steel
6120-24WT	Roto-Lock Raintight 30WT*	30"	76	27 5/8"	70	1/2"	13	160	73	Fab. Steel
6120-30WT	Roto-Lock Raintight 37WT*	37"	94	34 5/8"	88	1/2"	13	178	81	Fab. Steel
6120-37WT	Roto-Lock Raintight 42WT*	42"	107	39 5/8"	101	1/2"***	13	290	132	Fab. Steel
6120-42WT	Roto-Lock Raintight 48WT*	48"	122	45 5/8"	116	3/4"	19	390	177	Fab. Steel



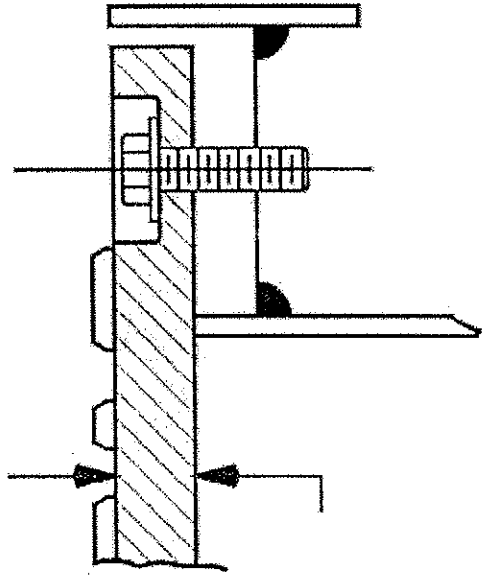
Section 1



Section 1

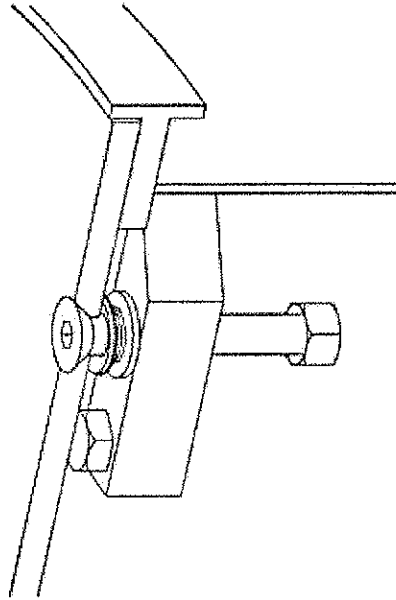
Section 1 (See Lid Thickness Dimensions)

Hex Head



Hex Head Detail

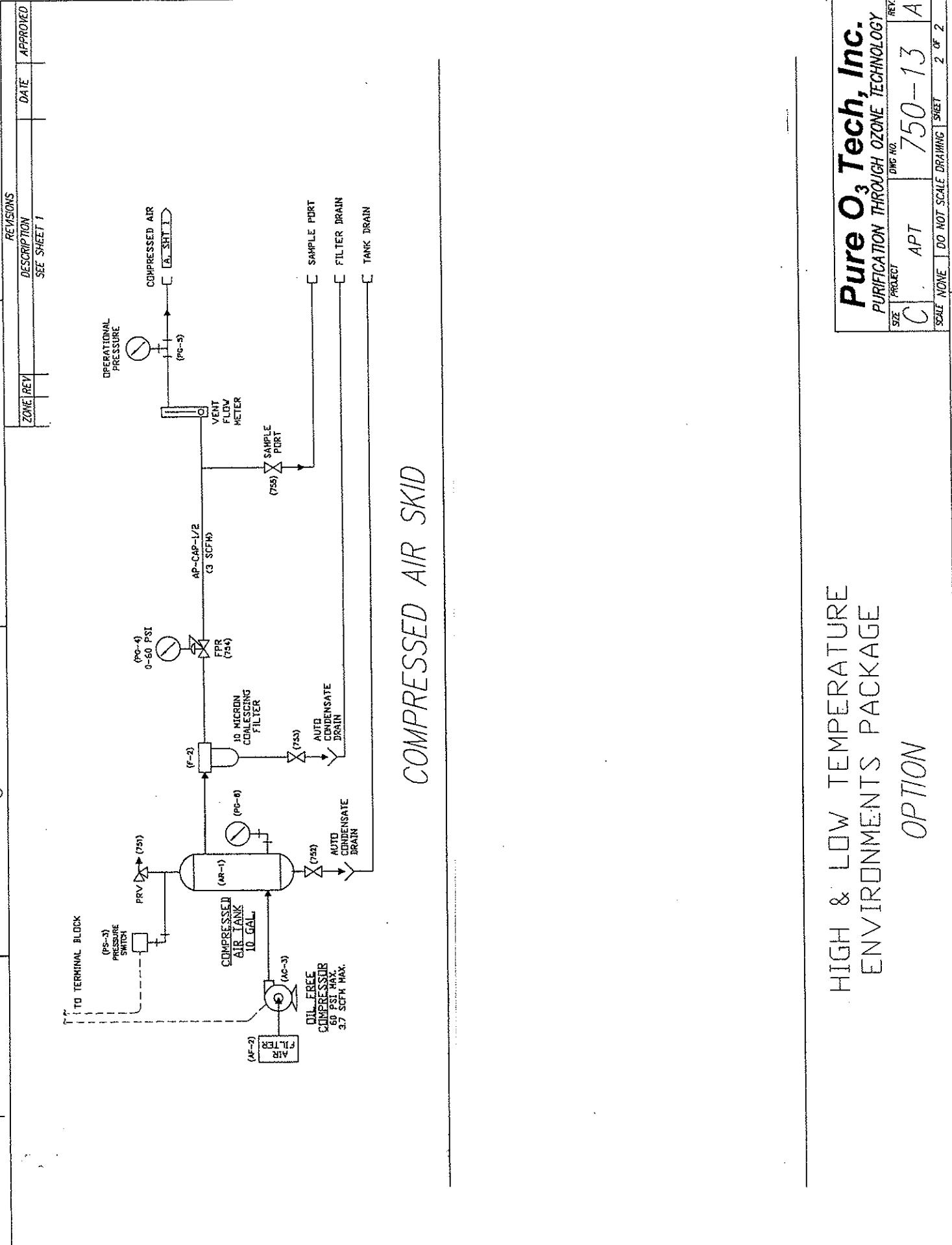
**Roto-Lock**



Roto-Lock Detail

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**Attachment B**  
**System Design Layout Cut Sheets**



HIGH & LOW TEMPERATURE  
ENVIRONMENTS PACKAGE  
OPTION

Pure O <sub>3</sub> Tech, Inc.			
PURIFICATION THROUGH OZONE TECHNOLOGY			
SIZE	PROJECT	DWG NO.	REV.
C	APT	750-13	A
SCALE	NONE	DO NOT SCALE DRAWING	SHEET 2 OF 2

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## **Appendix D**

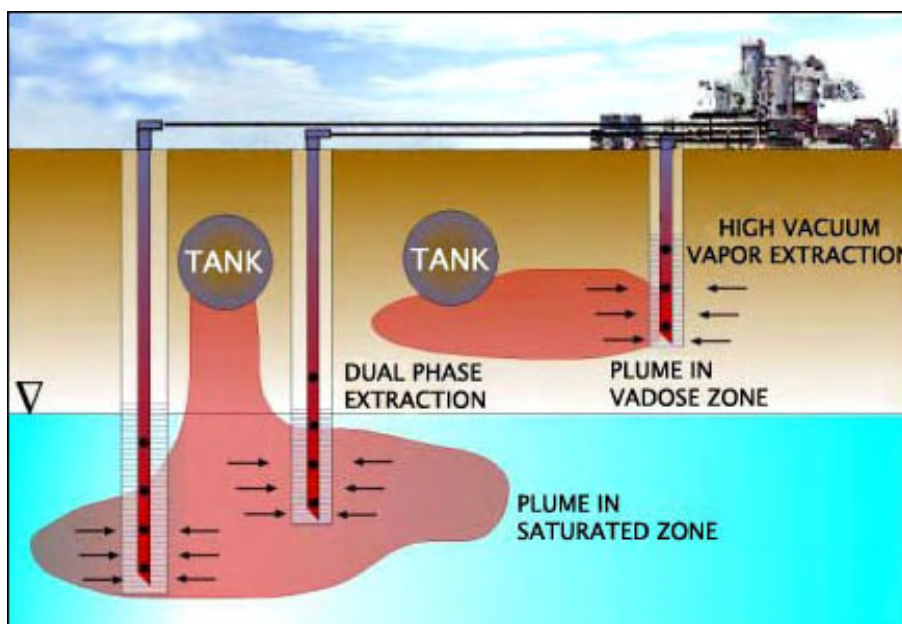
### **HVDPE Process Description and Diagrams**

# High-Vacuum Dual-Phase Extraction Process

## Description and Diagrams

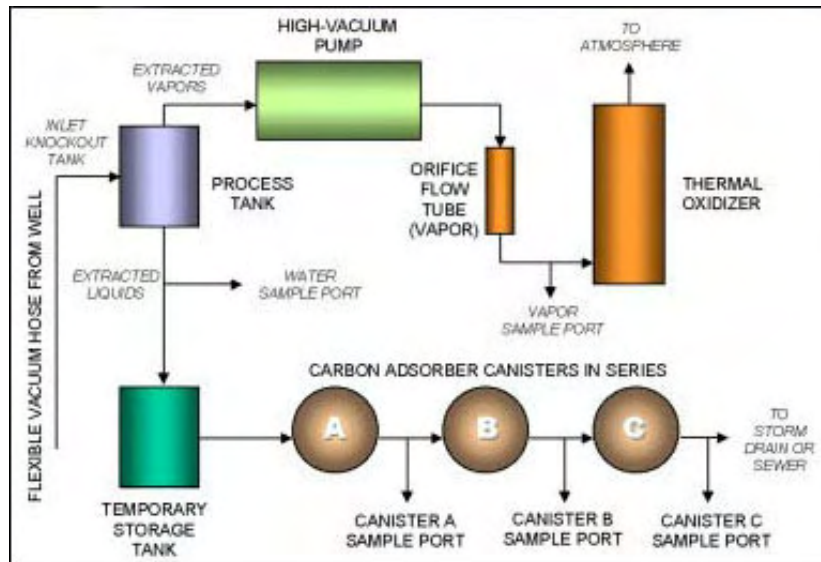
High-Vacuum Dual-Phase Extraction (HVDPE) uses a liquid ring pump to extract soil vapor by vacuum and groundwater by suction lift (Figure 1). Groundwater extracted during the HVDPE process is separated out using a liquid/vapor knockout (Figure 2). Up to 300 gallons per day of extracted water is reused in the liquid ring pump. The remaining water is treated through the on-site treatment process. Most of the hydrocarbon contamination (especially TBA) is removed from the extracted water by use of air stripping and heating while under high vacuum. The treated water is then treated by two carbon canisters in series or discharged directly to the sanitary sewer. A water meter is placed in line to measure the amount of water being discharged, and periodic sampling is performed accordance with the requirements of the sewer permit. It is expected that contaminated groundwater will be removed at the rate of up to approximately 2-7 gallons per minute.

**Figure 1 - Extraction Process**



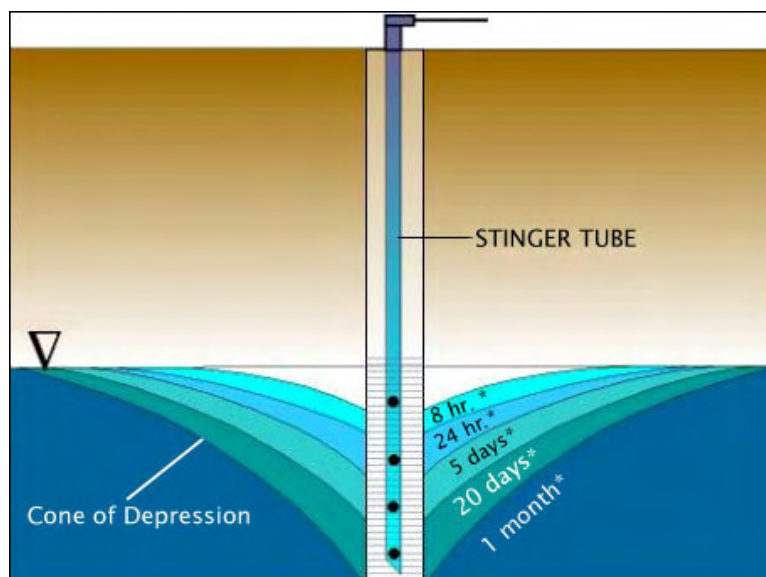
At least twice a day, the system operators will record system parameters such as vacuum, temperature, vapor flow rate, and the amount of groundwater extracted from the site. Groundwater drawdown/vacuum response in observation wells will periodically be measured. The operators will use a Horiba MEXA-324JU field analyzer, calibrated as hexane, for field measurements of influent hydrocarbon concentrations. Periodic vapor samples will be obtained and provided under chain-of-custody procedures to you for lab analysis of TPH-G (EPA Method 8015M) and BTEX/MTBE (EPA Method 8021).

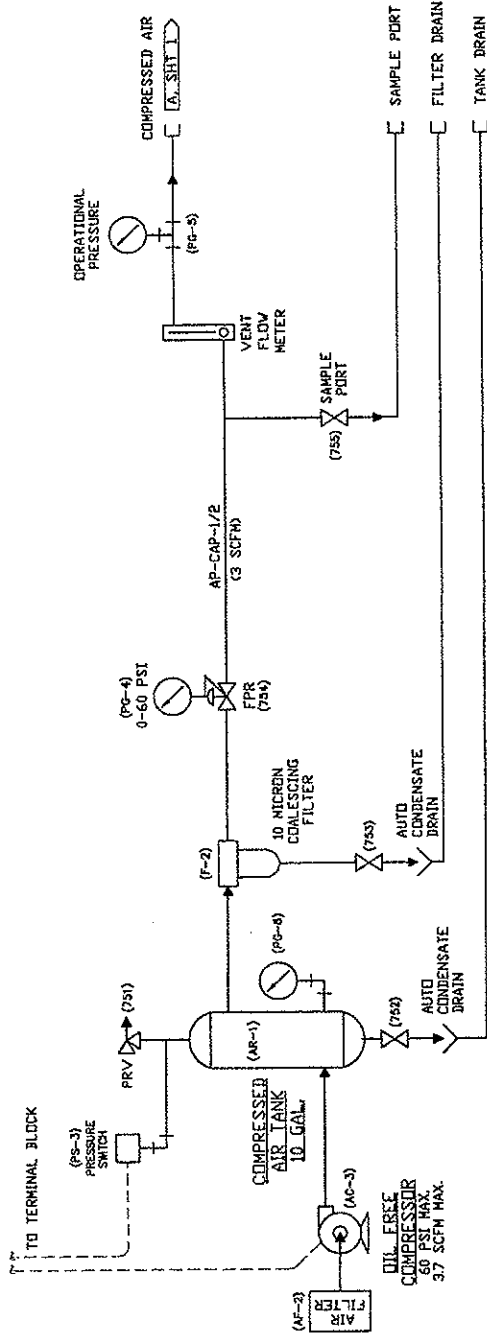
## Figure 2 - Flow Diagram



Groundwater drawdown levels will be measured during this process. Initially, a 1-1/4" ID stinger tubes will be lowered to the level of groundwater existing in the extraction well(s). As groundwater is extracted, the stinger tubes will be lowered gradually until they reach a desired depth. This will be done to dewater the saturated zone around the extraction wells and to dry up the capillary fringe and the saturated zone for high-vacuum vapor extraction. By keeping the stinger below the water table, the wells will remain dewatered for the remaining duration of the pilot test. This will increase the cone of depression around the wells and increase the area from which vapors can be extracted.

## Figure 3 - Groundwater Extraction





# COMPRESSED AIR SKID

HIGH & LOW TEMPERATURE  
ENVIRONMENTS PACKAGE

OPTION

**Pure O<sub>3</sub> Tech, Inc.**  
PURIFICATION THROUGH OZONE TECHNOLOGY

SIZE	PROJECT	DATE	REV.
C	APT	750-13	A
SCALE	NONE	DO NOT SCALE DRAWING	SHEET 2 OF 2